Aalto University
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Mitigating Consumers' Barriers to Exercise: A Short-Term Intervention Approach

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ABSTRACT

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PURPOSE OF THE STUDY

Physical inactivity has been pinpointed as the biggest public health problem of the 21st century for the welfare states. To overcome this issue, barriers to exercise -research has proven particularly important as it has been suggested that the perceived barriers may be the single most important predictor of consumers' health-related behaviors. Hence, the purpose of this study is to build consumer segments based on perceived barriers in order to enable commercial exercise and fitness service providers to better target these consumers with different marketing interventions aimed at reducing or eliminating these barriers. Therefore, the further objective of this study is to examine whether the interventions impact the perceived level of the barriers, and whether there are any emerging patterns of certain intervention types having greater impact on certain barriers.

METHODOLOGY

The present study applied a pre-test-post-test design and was organized in cooperation with a local gym. An initial web-based survey gathered 362 responses. The non-exercisers identified in preliminary survey were subjected to interventions with three types of appeals (rational, emotional and transformational) and were asked to refill the questionnaire. Three multivariate data-analysis techniques were applied to address the research questions. Factor analysis was used to identify exercise barriers underlying dimension, cluster analysis was conducted to discover exercise profiles based on the factor solution and repeated measures were applied to see whether barrier levels were affected.

FINDINGS

Unique profiles identified in the cluster analysis demonstrate that exercise barriers can be used to efficiently segment consumers for marketing purposes. Repeated measures show significant mitigations, and increases, in several barriers, the relevance of which was further interpreted from the perspective of both a commercial exercise and fitness service provider and public policy. Findings showed that cognitive and affective marketing appeals were most effective, whereas behavioral intervention was rather surprisingly least effective in mitigating barriers to exercise.

KEYWORDS: Barriers to exercise, determinants of physical activity, interventions, persuasive appeals in marketing, multivariate analysis

AALTO YLIOPISTON KAUPPAKORKEAKOULU TIIVISTELMÄ

Markkinoinnin laitos 21.12.2012

Pro gradu -tutkielma

Elina A. Enqvist

KULUTTAJIEN KOKEMIEN LIIKUNTAESTEIDEN LIEVENTÄMINEN:

Lähestymistapana lyhytaikaiset interventiot

TUTKIMUKSEN TAVOITTEET

Liikkumattomuus on yksi tämän päivän suurimmista kansanterveydellisistä huolenaihesta hyvinvointivaltioissa. Etenkin kuluttajien kokemien liikuntaesteiden tutkimus on saanut paljon huomioarvoa, sillä liikuntaesteet on nostettu yhdeksi tärkeimmistä kuluttajien liikuntatapoihin vaikuttavista tekijöistä. Tämän pro gradu -tutkielman tavoitteena onkin lisätä ymmärrystä aiheesta tarkastelemalla, voiko kuluttajia profiloida heidän kokemiensa liikuntaesteiden perusteella niin, että kaupalliset liikunta-alan yrittäjät pystyisivät paremmin kohdistamaan liikuntaesteiden alentamiseen tarkoitettuja interventioita. Lisäksi tutkimuksella pyritään selvittämään, ovatko nämä interventiot tehokkaita liikuntaesteiden madaltamisessa.

METODOLOGIA

Kokeellinen tutkimus suoritettiin yhteistyössä paikallisen kuntokeskuksen kanssa. Eksperimenttiä edeltävän kyselyn täytti yhteensä 362 henkilöä, joista vähiten liikkuville tarjottiin mahdollisuutta osallistua jatkotutkimuksiin. Näihin osallistujat jaettiin informatiiviseen, emotionaaliseen sekä toiminnalliseen interventioryhmään. Tutkimuskysymyksiä lähestyttiin kolmen monimuuttujamenetelmän keinoin: Faktorianalyysillä tunnistettiin liikuntaesteiden taustalla vaikuttavat ulottuvuudet, jonka jälkeen klusteroinnilla kuluttajat ryhmiteltiin toisistaan eroaviin liikkujaprofiileihin; Intervention jälkeen osallistujat vastasivat kyselyyn uudestaan ja toistetun mittauksen analyysillä seurattiin, tapahtuiko koetuissa liikuntaesteissä muutoksia.

TULOKSET

Klusteroinnilla tunnistetut liikkujaprofiilit osoittavat, että liikuntaesteitä voidaan hyödyntää segmentoinnissa ja markkinointitoimenpiteiden kohdentamisessa. Toistettu mittaus paljasti, että eri interventiot johtivat merkittäviin muutoksiin osassa liikuntaesteitä. Interventioista informatiivinen ja emotionaalinen olivat tehokkaimpia liikuntaesteiden madaltamisessa, mutta yllättävä tulos oli toiminnallisen intervention liikuntaesteitä vahvistava vaikutus.

AVAINSANAT:

Liikuntaesteet, fyysiseen aktiivisuuteen vaikuttavat tekijät, interventiot, vetoomusten käyttö markkinoinnissa, monimuuttuja-analyysi

Table of Contents

1. Introduction

This chapter introduces the topic of consumers' perceived exercise barriers and the interventional approach to mitigating them by first describing the background of the study. Secondly, this chapter defines the research problem and objectives, sets the methodology and scope of the study, and finally outlines the structure of the remaining report.

1.1. Background

Physical activity and exercise are partly overlapping concepts. Caspersen, Powell and Christenson (1985, cited in Biddle & Mutrie 2008, 9) have defined physical activity and exercise in terms of the following three elements: Movement of the body produced by the skeletal muscles; resulting energy expenditure which varies from low to high; and a positive correlation with physical fitness. What differentiates exercise from physical activity is that exercise is 'planned, structured and repetitive bodily movement' the objective of which is to maintain or improve physical fitness whereas physical activity may refer to any physical movement (Caspersen, Powell & Christenson 1985, cited in Biddle & Mutrie 2008, 9). Here these two concepts are used synonymously. Further, physical inactivity has been used to refer both to insufficient physical activity and sedentary behavior (Van der Horst et al. 2007). Here the focus is on insufficient physical inactivity, i.e. not reaching the recommended amounts of moderate to vigorous activity, rather than on sedentary behaviors such as watching television or sitting at the workplace.

Medical and health sciences have strongly linked exercise and fitness to physical and psychological health (e.g. Hassmén, Koivula & Uutela 2000). Links between exercise and reduction of varied physical ailments such as heart diseases and diabetes, have been established (e.g. Hu et al. 2004; Myers et al. 2004), as wells as links between physical inactivity and secondary health complications like obesity and psychological ill-being. Physical activity has been associated with mental well-being: it seems to relieve depression

and increase cognitive performance (e.g. Thayer 1987). Not surprisingly, physical inactivity has been pinpointed as the biggest public health problem of the 21st century for the welfare states (Blair 2009), and promoting physical activity and exercise has become a battle against the increasing time spent on sedentary behaviors (Owen et al. 2010).

Consequently, various disciplines, such as sports and preventive medicine, public health research, and health psychology, have been interested in (perceived) barriers to exercise, i.e. individual's assessment of potential obstacles that interfere with health behavior (Schwetschenau et al. 2008). The barrier research is particularly important, as it has been suggested that the perceived barriers may be the single most important predictor of individuals' health-related behaviors (see Ransdell et al. 2004 for a review). Understanding the barriers is vital as the portion of people not meeting the public health guidelines of 30 to 60 minutes of daily moderate to vigorous physical activity is alarming (e.g. Blair, LaMonte & Nichaman 2004; Kahn et al. 2002).

In addition to identifying the barriers, research has also noted the importance of identifying measures reducing or eliminating those barriers (e.g. Dunlap and Barry 1999). Most of this research has looked into different types of interventions, and many have gained promising results (e.g. Brinthaupt, Kang and Anshel 2010; Rimmer et al. 2010). However, as Schutzer and Graves (2004) note, most of the tested interventions have involved intense education with lengthy contact between study participants and researchers. The intervention procedures are time-consuming and expensive, and therefore unfeasible to accomplish on a wide scale. From a public health perspective, it would be imperative to find shorter-term, more affordable ways to reduce the barriers to exercise.

Finland is an interesting context for barrier research. The Finns have been reported to be most physically active in the European Union (Martínez-González et al. 2001 cited in Seefeldt, Malina & Clark 2002, 146). However, for instance Telema and Yang (2000) has shown that the age-related decline in physical activity is a real problem in Finland. Further, even those consumers' who do exercise may perceive barriers to some aspects of exercising (Miller 2002).

1.2. Research Problem and objectives

Intervention research in exercise and physical activity has been criticized for not having a theoretical framework or model to examine the efficacy of an intervention (Sallis & Owen 1999). Furthermore, previous research has used lengthy and costly means that would not be feasible for promoting public health nation-widely.

Therefore, there is a need for research that examines the effects of short-term interventions on perceived barriers. Accordingly, the objective of this study is to investigate consumers' perceived barriers, and whether distinct barrier profiles can be identified to more efficiently target interventions. Also, a question of major interest to this study is whether consumers' perceived barriers to exercise can be mitigated by using these short-term, marketer-staged interventions, and if so, what kind of interventions are effective for reducing different barrier types.

The study calls on the following main research question:

> *How can a commercial fitness and exercise service provider mitigate consumers' perceived barriers to exercise with short-term marketing interventions?*

The main research question is approached with the help of the below sub-questions:

> *How perceived exercise barriers affect consumers' exercise behavior? (Chapter 2)*
>
> *What types of consumer segments can be distinguished based on different barrier types in order to better manage, comprehend and target the specific barrier types? (Chapters 4 and 5)*
>
> *How marketing practices can be used in interventions aimed at mitigating exercise barriers? (Chapter 2)*
>
> *What marketing appeals are most effective regarding different barriers? (Chapter 5)*

The emphasis of this thesis is on the pre-intervention analysis. Nevertheless, this study also has implications for further research from preliminary post-intervention data.

1.3. Methodology and scope

Empirical part of the study is based on data collected in a local survey conducted in cooperation with a private fitness service provider. A questionnaire sent to nearly 2 000 persons covers the respondent's current level of physical activity and background information, perceived benefits from exercising, perceived barriers to exercise, and contact details. The non-exercisers are identified from the data, and are subjected to different types of interventions in order to identify causalities between the interventions and the perceived level of the barriers, and whether there are any emerging patterns of certain intervention types having greater impact on certain barriers.

To address the aforementioned research questions, two exploratory multivariate techniques, factor and cluster analysis, are applied to analyze the data. Repeated measures are further used to analyze the effect the interventions had on the subjects' perceived level of exercise barriers.

1.4. Structure

The remaining report is structured as follows: Chapter 2 outlines the literature review on exercise barriers, interventions and persuasive appeals in marketing interventions. In chapter 3 the empirical study is presented: Research methods, data collection procedures, statistical analysis methods used in conducting the study, and validity and reliability are discussed more in detail. The findings of the empirical study are presented, analyzed and interpreted in chapter 4. Finally, chapter 5 summarizes the findings of the study and draws implications for managers, public health and future research.

2. Literature review

2.1. Barriers to exercise

Barriers to exercise or physical activity are often defined as any factors that create impediments for exercising (e.g. Lox, Martin & Petruzello 2003; Gyurcsik et al. 2006), or as any obstacles that individuals face in undertaking, maintaining or increasing physical activity (Allison et al 2005, 156). In other words, barriers negatively affect the readiness to commence exercising or adherence to it. Sallis and Owen (1999) have defined barriers more specifically as either real or perceived individual, interpersonal or contextual factors preventing individuals from engaging in exercise or hinder their ability to do so. What the authors refer to with *perceived* barriers does not necessarily mean fundamentally non-existing, made-up barriers. Rather, I would think of perceived barriers as *beliefs* of the negative outcomes of the exercise behavior ("I'll be all sweaty", "I'm not the sporty type"), that undermine exercise behavior. To the individual the perceived barriers are real enough to avert exercise, even though they do not make exercising impossible. In this context 'perceived barriers' and 'barriers' are used as synonyms to the extent that both refer to barriers that the individual acknowledges him or herself to face.

An individual's perceived barriers to exercise are an important factor for predicting activity level (Trost et al. 2002). Kowal and Fortier's (2007) findings revealed that physically active adults experience less barriers compared with those leading more sedentary lifestyles. This highlights the importance of exercise barriers as a determinant of physical activity as the process of behavior change is challenging, especially when barriers exist. Routines and habits, and attitudes toward the wanted behavior [here exercise] are firmly rooted to an individual's cognitia and affect, and breaking out from them, i.e. changing behavior, can cause considerable discomfort (Anshel & Kang 2007, 87).

Various studies have attempted to identify the exercise barriers with greatest effect on physical activity. The most examined barrier to exercise, and the one with most importance assigned to, is lack of time (e.g. Adachi-Mejia et al. 2010; Brinthaupt, Kang & Anshel

2010; Stutts 2002). From a commercial fitness and exercise service provider's point of view, this is probably the most challenging barrier to overcome regardless whether the time-related barrier is real or perceived, i.e. whether lack of time is a real hindrance or solely a convenient excuse for physical inactivity (Sallis & Owen 1999). On the other hand, the growth of the home fitness equipment industry has offered a possible solution (McKehnie et al. 2007). A determinant that has also been the focus of attention for physical activity promotion research and consistently associated with physical activity is perceived self-efficacy (Bandura 1997; Sallis & Owen 1999). Because of its relation to physical activity and exercise barriers, it will be studied more in detail (see section 2.1.2).

Miller (2002) noted that most people, even those exercising regularly, lack enjoyment or find some aspect of exercising unpleasant, e.g. consumption of time, experiencing physiological stress, self-consciousness if exercising in public etc. Hence, the underlying barrier to be overcome might actually be the required lifestyle change.

When it comes to differences in barriers between gender, women have been reported to be less involved in exercise than males, which explains why so much attention has been devoted to this group (Allison et al. 2005). Among the most commonly reported barriers to women's exercise are lack of time, energy, company or motivation, care giving duties, fatigue, health problems and self-consciousness about appearance (Booth et al. 1997; King et al. 2000). Men's exercise barriers are commonly related to lack of time, engagement to other sedentary, often technology-related activities, self-consciousness and awareness of the opinion of the significant others (Allison et al. 2005; Booth et al. 1997).

Some variables have shown consistent association with physical activity across age groups, for instance male gender (e.g. Hinkley et al. 2008; Trost et al. 2002; Van der Horst et al. 2007). Nevertheless, most physical activity correlates, including the barriers, have been reported to vary across life course (Sallis & Owen 1999). Moreover, it is good to note that physical activity is negatively associated with age itself (Trost et al. 2002).

Allender, Cowburn and Foster (2006) have reviewed qualitative research studies on UK citizens' reasons for participation and non-participation in physical activity. The findings suggest that the perceived barriers vary across different age groups. The barriers children

and youth reported included negative experiences during school physical activity classes, gender stereotypes, peer pressure, competitive nature of sports and masculinity (especially for girls). Adults seemed to lack the confidence about entering unfamiliar surrounds such as gyms, had a poor body image and lacked realistic role models. Older adults' barriers were related to unclear guidance, e.g. uncertainty about the right amount of physical activity, and lack of realistic role models. Moreover, physical activity was not perceived as relevant for someone of older age. Booth et al.'s (1997) study on physical activity barriers revealed that the major barriers among older population, those over 60, are injury or poor health, fear of getting injured and perceiving self as too old.

A lot of attention has been devoted to adolescents' perceived barriers (e.g. Allison, Dwyer & Makin 1999; Allison et al. 2005; Gyurcsik et al. 2006; Van der Horst et al. 2007). Gyurcsik et al. (2006) found out that number of barriers increased as the grade in school increased. Major barriers included lack of motivation and other competing interests; however, lack of time due to school work and other interests, one of the most important barriers among adolescents according to Allison, Dwyer and Makin (1999), was not acknowledged at all. Only a small number of studies have focused on preschool children's physical activity correlates. Hinkley et al. (2008) reported that three variables correlate with preschool children's physical activity: gender (male), parents' physical activity participation and time spent outdoors.

Minorities', for instance people with specific disability or illness and different racial-ethnic groups, perceived exercise barriers have been widely researched (e.g. Kang et al. 2007; King et al. 2000). Overall, persons with disabilities are less likely to participate in physical activity (e.g. Rimmer et al. 2004). Earlier studies on barriers to regular exercise have been carried out in several patient groups such as those with spinal cord injury (e.g. Kehn & Kroll 2009), diabetes (e.g. Korkiakangas, Alahuhta & Laitinen 2009), arthritis (e.g. Brittain, Gyurcsik & McElroy 2011) and cancer (e.g. Courneya et al. 2008). Unique barriers for people with disability or illness are often concerned with discomfort or pain, people's misconception of the disabled's physical condition or ability (Kang et al. 2007), and poor accessibility to facilities (Rimmer et al. 2004).

Studies on various racial-ethnic groups', for instance African American and Hispanic, exercise behaviors have showed that physical inactivity is more common for people part of these non-white ethnicity groups when comparing to White (e.g. Marshall et al. 2007; Seefeldt, Malina & Clark 2002). For instance cultural values and low socio-economic status may present unique barriers to racial-ethnic groups.

Among the 15 [in 2001] member states in the European Union, Finland had the highest percentage of its population (91.9%) engaged in leisure-time physical activity (Martínez-González et al. 2001 cited in Seefeldt, Malina & Clark 2002, 146). Zunft el al.'s (1999) population-based study on perceived barriers in EU countries revealed that the most significant barriers to physical activity in Finland were 'no energy' (highest of all of EU member states with 19% compared to EU average 11%) and 'work/study commitments' (16%). There were differences across countries, and Finland also differed from the EU averages (major barriers being 'work/study commitments' 28% and 'not the sporty type' 25%). The percentage of those subjects who chose work/study commitments as a barrier to physical activity was the greater the higher the education level they had. The same trend was obvious in all of the countries. At EU level, it was interesting to note that the barrier "poor health" was the lowest within the age group 55+, and the same age category had highest percentage of subjects stating that "no need" was an important barrier to physical activity, which pretty much is against logic.

Furthermore, when comparing Finland to other Scandinavian countries that were included in the study, Sweden and Denmark, there were some interesting points. First of all, for Swedes the major barrier to increasing levels of physical activity was "not the sporty type" (25% compared to Finns' 12%). The "no need" barrier was highest in Denmark (13% compared to Finland's and Sweden's 6%) as was the "work/study" barrier (21% compared to Finland's 16% and Sweden's 17%). Moreover, the barrier of "too old" was the lowest in Finland (3% compared to Denmark's 7%, Sweden's 6% and the EU average of 10%). (Zunft et al. 1999)

2.1.1 Different barrier types

The multidimensionality of physical activity behavior and barriers to exercise has been well acknowledged, and physical activity correlates and barriers have been approached along several dimensions in previous research (Brinthaupt, Kang & Anshel 2010; Hinkley et al. 2008). In order to find out whether different barriers types could be used as a criterion in segmentation to better manage and target the barriers to exercise, previous researches' way of treating barriers is considered.

Some categorizations discussed here are mainly directed at classifying all sorts of physical activity correlates, but the focus is on identifying different ways of categorizing barriers that present a significant type of correlates of physical activity. The question of whether exercise barriers should be presented as correlates of physical activity, physical inactivity or sedentary behavior has been averted in research. In this context all correlates with negative association with physical activity, or all correlates with positive association with physical inactivity are thought of as barriers. However, what comes to sedentary behavior, Owen et al. (2010) suggest that even an individual meeting the public health guidelines on physical activity can live sedentary life, i.e. life involving low levels of energy expenditure during work, commuting and leisure time due to overall time spent sitting. Hence, the concepts of physical activity and sedentariness are not exclusive. As the purpose of the study is to reveal barriers to exercise, not motivators to sedentary behavior, correlates of sedentariness are excluded.

Allison, Dwyer & Makin (1999) and Ziebland et al. (1998) used the categorization between internal and external barriers. Internal barriers refer to more individual, psychologically based factors, whereas external barriers represent environmental factors that are outside of one's own control. Categorization using the same principles is the division of barriers to intrinsic and extrinsic barriers, used by, for instance, Adachi-Mejia et al. (2010). The concepts of internal and intrinsic, as well as external and extrinsic, are taken as synonyms in this thesis. If we take an opposite approach and look at the concepts of intrinsic and extrinsic as derived from the motivational theories, intrinsic motivation is motivation driven by the task, which in itself is seen as the "reward" (Biddle & Mutrie 2008). Vice

versa, intrinsic exercise barriers refer to activity-related internal factors preventing one from exercising by demotivating, for instance perceived laziness, lack of time or lack of enjoyment. In other words, the task (here physical activity) is not seen as a "reward" but rather as a punishment ("I could be doing something much more valuable with my limited time"). Exercising is not seen as motivating in itself, and perceived barriers encourage or back up the rationalization. Adachi-Mejia et al. (2010) identified barriers with strongest association with physical activity in their study of rural mothers' perceived intrinsic barriers. Lack of self-discipline, lack of time and lack of interest were the most significant internal barriers demotivating exercise behavior. In extrinsic motivation the motivation for performing the task or behavior comes from outside in the form of an external stimuli. Put the other way around, extrinsic exercise barriers are external factors, such as costs, lack of facilities or transportation, significant others not interested etc. (Ziebland et al. 1998) that hinder exercise behavior by demotivating it, or "punishing" it ("Gym memberships are expensive", "my family would not approve of it").

People with external barriers are more likely to change exercise behavior than people with internal barriers (Ziebland et al. 1998). However, whereas internal barriers typically require individualized interventions, overcoming external barriers to exercise typically require a public policy approach, for instance developing infrastructure or changing general attitude toward physical activity.

In this thesis I have used the terms 'barrier' and 'perceived barrier' as synonyms. Perceived barriers, nonetheless, refer to more psychological barriers that exist subjectively in the minds' of the consumers. Hence, action could be taken but the barrier reduces motivation, willingness and ability to do so, as will be shown in section 2.1.2. Objective barriers, on the other hand, are real obstacles for participation in physical activity: Even though one wanted to exercise, the barriers hinder the action. Examples of the former type of barriers include fear of injuries and lack of time, and the latter limited access to facilities and disability (Brinthaupt, Kang and Anshel 2010). Objective barriers are harder to overcome, whereas perceived barriers can be targeted with individualized interventions. On the other hand, perceived barriers must be overcome regardless of the existence of objective barriers: If an individual's affect is against exercise, removing external barriers such as improving sport

facility availability or lowering costs are unlikely to have an effect. We can observe that objective and external, and perceived and internal barriers somewhat overlap to the extent that objective and external barriers are factors that we are not able to control, whereas perceived and internal barriers are predominantly demotivating attitudes and beliefs that are to some extent under our control.

Pender, Murdaugh and Parsons (2005) have further noted the direct and indirect effects of barriers on positive behavior change. Barriers with direct effects reduce exercise behavior mainly without intermediate effects (e.g. lack of facilities), whereas barriers with indirect effects impact exercise behavior by reducing commitment, motivation or perceived ability to perform (see section 2.1.2) certain behavior, which in turn impacts the behavior itself (e.g. no support from peers, perceived lack of skills). Barriers have also been approached either as invariable factors, such as age, gender and ethnicity, or modifiable factors, e.g. behavioral and personality traits, and environmental and community factors (Higgins, Rickert & Naylor 2006; Seefeldt, Malina & Clark 2002). This categorization provides an important frame for barriers that cannot, or can and should be targeted when trying to reduce physical inactivity.

None of the barrier dimensions or types are fully exclusive. For instance the barrier of lack of time has usually been classified as a perceived barrier. Allison et al. (2005), however, classified time as an external barrier, which highlights the subjectivity of barriers. Time barrier can be a real obstacle for exercising, or solely a psychological excuse: Lack of time could be seen as either perceived or objective, or direct ("there's just no way I can take the time for exercise") or indirect ("not enough time to spend time with family and at the gym, need to prioritize") barrier. Because of this overlap, more comprehensive barrier categorizations are required so that when used as a basis for segmentation, the groups would differ in meaningful variables.

Higgins, Rickert and Naylor (2006) and Timmerman (2007) acknowledge three types of barriers: internal or intrapersonal (e.g. lack of motivation or commitment, health issues, lack of skill), interpersonal (e.g. lack of training partner, family demands) and environmental (e.g. access to facilities, climate). This is based on the socio-ecological model that explains how environment and behavior affect each other (Higgins, Rickert and

Naylor 2006). McLeroy et al. (1988, cited in Gyurcsik et al. 2006, 705) have further identified institutional, community and public policy related barriers. Institutional barriers occur within social institutions (e.g. gym opening times or non-flexible hours at work place); community barriers are barriers occurring between organization, institution and informal networks (e.g. lack of facilities or transportation); and public policy related barriers are local and national laws and policies preventing exercise.

Biddle and Mutrie (2008) suggest that there are four types of physical activity correlates, (1) personal and demographic, (2) psychological, (3) social and (4) environmental. Age, gender and socio-economic status are examples of the first type of correlates. Psychological correlates, such as perceived self-efficacy, are attitudes towards and beliefs about the exercise behavior and perceptions of possessed skills and control. Social and environmental correlates are factors such as peer support and facility convenience and accessibility that affect, or are thought to affect, participation in exercise and physical activity.

Similar but more in depth approach was taken by Sallis, Prochaska and Taylor (2000). Using a social-ecologic framework, Sallis et al.'s (2000) and Van der Horst et al.'s (2007) reviews on correlates of physical activity in children and youth or adolescents classified the factors in five groups: (1) demographic and biological, (2) psychological, cognitive and emotional, (3) behavioral attributes and skills, (4) social and cultural, and (5) physical environmental factors. The same approach was also used by Trost et al. (2002) when reviewing physical activity determinants in adults. Trost et al. (2002), however, added a sixth dimension of physical activity characteristics.

The latter discussed divisions are notably more specific than the two-dimensional categorizations. However, it is important to acknowledge when classifying barriers that for instance age, a demographic and biological correlate, may actually itself include subcategories of barriers such as perceived lack of skills or fear of injury, which could have been classified as psychological, cognitive and emotional correlates. Tables 1 shows how the above discussed barrier types relate to each other and what different exercise barrier types have played a role in previous physical activity studies. We can note that Higgins, Rickert and Naylor's (2006) and Timmerman's (2007) categorization is the broadest and is

complemented by Biddle and Mutrie's (2008), Sallis, Prochaska, and Taylor's (2000), Van der Horst et al.'s (2007) and Trost et al.'s (2002) dimensions.

Authors	Higgins, Rickert & Naylor 2006; McLeroy et al. 1988; and Timmerman 2007	Biddle & Mutrie 2008; Sallis, Prochaska & Taylor 2000; Trost et al. 2002; and Van der Horst et al. 2007	
Barriers by category	Internal / intrapersonal	Biological & demographic	Age
			Body Mass Index
			Ethnicity (non-white)
			Gender (female)
			Low socioeconomic status
		Psychological, cognitive & emotional	External locus of control
			Lack of perceived competence
			Lack of perceived benefits
			Lack of knowledge of exercise / health
			Lack of enjoyment
			Low self-efficacy
			Low self-esteem
			Negative attitudes
			Perceived physical appearance /body image
		Behavioral attributes & skills	Cigarette and alcohol use
			Non-healthy diet
			Previous physical activity
			Sedentary time
		Perceived physical activity characteristics	Perceived intensity
			Perceived effort
	Interpersonal	Social & cultural	Parent and peer sedentary activity
			Support from family / significant others / peers
	Environmental	Physical (built) environment	Convenience and accessibility of facilities
			Lack of opportunities to exercise
			Lack of available resources/ equipment /facilites
			Weather / season
		Community, institutional & public policy	Laws and policies
			Safety

Table 1 Barrier types

Having gone through a comprehensive number of studies in the field of physical activity and barriers to exercise, it was striking to notice that different exercise barrier types have never been used for the purposes of segmentation. The significance of appropriate segmentation method and the discovery of new, relevant variables for use as bases for segmentation [hence barriers in physical activity] has, however, been well grounded in previous marketing research (Wind 1978; Martin 2011). Next I clarify the means by which the barriers affect exercise behavior, and hence, why the barriers ought to be mitigated to promote physical activity.

2.1.2 Barriers impact on consumers' exercise behavior

Various theories of health behavior have been applied in the context of exercise programs and individuals' adherence to them (Seefeldt, Malina & Clark 2002; more in chapter 2.2.1). These theories aim at presenting the relationships between the underlying factors that are proposed to be related to the behavior at hand (Biddle & Mutrie 2008). Participation in behaviors that affect health, here the focus being on physical activity, has also been theoretically approached by Pender, Murdaugh and Parsons (2005).

Pender's Health Promotion Model, or HPM, (Pender, Murdaugh & Parsons 2005) classifies factors contributing to health behavior into individual characteristics and experiences, and behavior-specific cognitions and affect. As individual characteristics and experiences, i.e. biological, psychological and sociocultural personal factors and prior related behavior, are largely non-modifiable, attention is often directed at the behavior-specific cognitions and affect. These factors include perceived benefits of and barriers to the behavior, perceived self-efficacy, affective cues to the behavior, and situational and interpersonal influences. The situational/interpersonal influences are behavior-affecting social and environmental factors (Srof & Velsor-Friedrich 2006, 367; Pender, Murdaugh & Parsons 2005). Here Pender's Health Promotion Model from 1982, (revised in 1996) is used to discuss the impact of barriers on exercise behavior because it acknowledges comprehensively different barrier types (refer to Table 1) and combines most of the central tenants from different theories used to explain physical activity behavior, e.g. self-efficacy from social cognitive theory and environmental and socio-cultural variables from ecological perspective.

The illustration of the HPM is shown in Figure 1. To first get the big picture, the model proposes that prior related behavior and personal factors affect the behavior specific cognitions and affect, which in turn lead to a behavioral outcome. In other words, our background affects how we think and feel about certain activity which again guides our behavior. When looking at individual factors and their relationships within the framework, the model entirely separates interpersonal and situational influences from perceived benefits, barriers, self-efficacy and activity-related affect. However, within the latter grouping, the activity-related affect is showed to influence self-efficacy, which in turn has

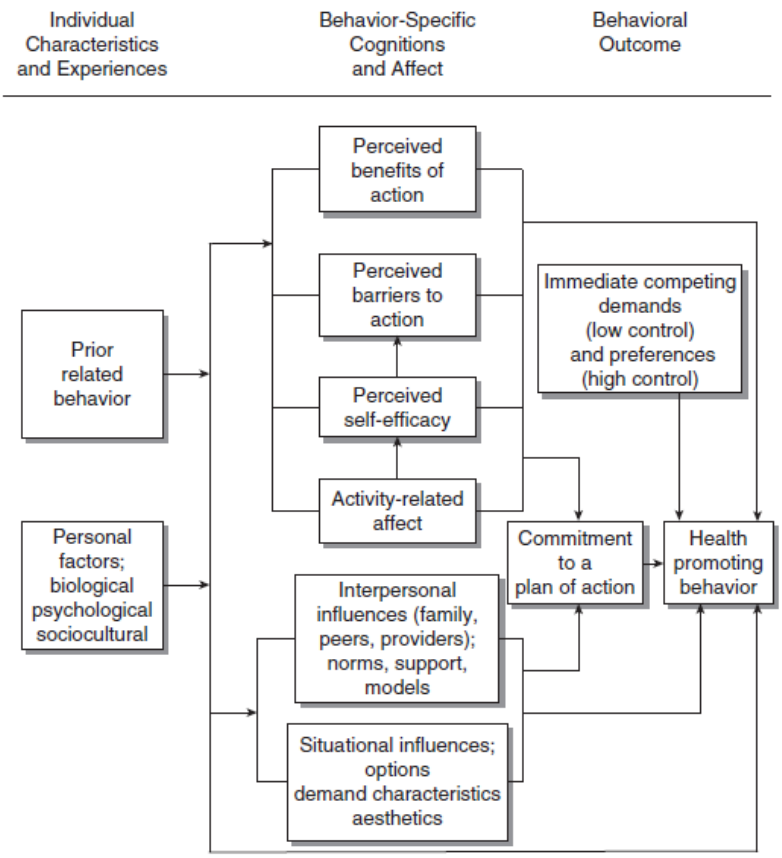

Figure 1 The Health Promotion Model (Pender et al. 2005)

an effect on perceived barriers. Nevertheless, the perceived benefits are not shown to have any relation to the aforementioned factors.

According to Shine et al.'s (2006, 5) review, the HPM suggests that one's commitment to an action plan (e.g. regular exercise) is influenced by the perceived benefits of and barriers to the action, and individual's beliefs concerning their self-efficacy. The HPM variables with most significance predicting health promoting behavior were self-efficacy (86%), perceived barriers (79%), prior behavior (75%) and perceived benefits (61%) (Pender, Murdaugh & Parsons 2002 cited in Shin et al. 2006, 5). The relative significance of perceived barriers over benefits emphasizes the importance of barrier related research. However, the mediating effects of social and environmental influences should not be underestimated because they also are shown in HPM to have a straight link to commitment (Pender, Murdaugh & Parsons 2005).

The HPM gives a rather simplistic and straightforward image of barriers contribution to exercise behavior: The perceived barriers to action are mediators of behavior as they constrain commitment to action (Pender, Murdaugh & Parsons 2005). I would add to the Health Promotion Model (Figure 1) that barriers in association with inferior perceived benefits, low self-efficacy, lack of positive affect, and negative social and environmental influences demotivate certain behavior by affecting a person's willingness and perceived ability to perform, and thereby, decrease commitment. This I based on the inference that if there were a negative affect, no perceived benefits and low self-efficacy regarding exercise, there would be no need, want and perception of ability to commit to exercise.

Furthermore, the HPM shows that an individual's perceived self-efficacy may also indirectly affect the commitment by resulting in more barriers or by reinforcing them (low perceived self-efficacy), or resulting in fewer barriers or weakening the perceived barriers (high perceived self-efficacy). The concept of self-efficacy has been indicated to be an influential variable on commitment to physical activity (e.g. Shin et al. 2006; Bandura 1997; Van der Horst et al. 2007) and acknowledging its relation to exercise barriers, it will be discussed more in detail later on (see chapter 2.1.3).

To better depict the interactive nature of physical activity variables, I propose that the factors in the 'behavior-specific cognitions and affect' grouping have several more reciprocal effects on one another than what the HPM illustration suggests. First of all, I would argue that the perceived benefits of action, or rather the lack of them or their irrelevancy to an individual, can influence the importance assigned to the barrier, or the 'strength' of the barrier, and vice versa. I also claim that the activity-related affect shapes not only self-efficacy but also both the perceived benefits and barriers. For instance, positive affective cues toward the wanted behavior would emphasize the benefits and compensate for the barriers. Moreover, agreeing that the activity-related affect impacts self-efficacy, equally well self-efficacy may impact the affect – e.g. a person with high confidence in him or herself in certain activity is more likely to feel positive about the action. Lastly, the interpersonal and situational influences shape activity-related affect, and perceived efficacy, benefits and barriers. For instance, non-supportive peers (interpersonal influence) and harsh climate (situational influence) would strengthen the perceived barriers,

lower the perceived benefits and self-efficacy and decrease affect ("Friends wouldn't approve of my behavior, and I don't possess good enough skills to go out there alone"). A revised model of the HPM is presented after relating the model more in depth with the concept of self-efficacy.

2.1.3 The role of self-efficacy in determining physical activity

Perceived self-efficacy refers to beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments (Bandura 1997, 3). Hence, self-efficacy is not concerned with the skills but with judgments of what one is capable of with the skills one possesses. Most importantly, self-efficacy represents the confidence a person has in being able to enact a certain behavior (Allison, Dwyer & Makin 1999, 609). I think the concept of self-efficacy is crucial in understanding individual's exercise behavior as it reflects the confidence one has, and therefore, the effort one is willing to put in to overcome the barriers. After all, a person's perceived capabilities are more motivating than the objective 'truth' of one's abilities (Bandura 1997). Hence, self-efficacy is a significant concept in physical activity research. Self-efficacy has thus far been supported as the strongest predictor of health promoting behavior in adolescents (Srof & Velsor-Freidrich 2006, 372), but also as an important correlate of physical activity in both adults and children (Allison, Dwyer & Makin 1999).

Even though self-efficacy has been shown to be an important correlate of physical activity participation (e.g. Allison, Dwyer & Makin 1999; Booth et al. 2000), it has often been studied as an individual correlate of exercise participation – not considering the direct and indirect effects it might have with other physical activity correlates. Previous research has not seemed to agree whether (low) self-efficacy has solely a direct effect on exercise behavior, or whether it has also a mediating effect on exercise barriers, whether it is a barrier in itself etc. For instance Hofstetter et al. (1990, cited in Allison, Dwyer & Makin 1999, 609) found out that perceived barriers are one of the key predictors of self-efficacy. On the other hand, a reverse relationship has been argued, i.e. self-efficacy being a factor

indirectly affecting behavior by weakening or strengthening the perception of barriers (e.g. Rogers et al. 2007). Therefore, I could also argue that low self-efficacy is a demotivating factor hindering exercise, and thus, can be seen as a barrier to exercise in itself.

Self-efficacy conceptually links the relationship between individual and environmental factors (Allison, Dwyer & Makin 1999 cited in Allison et al. 2005, 166). Pender's Health Promotion Model presented earlier acknowledges all the sources of perceived self-efficacy (see Bandura 1997; Biddle & Mutrie 2008, 108-109), which seem to consist of individual and environmental factors: *Enactive mastery experience* is reflected as prior related behavior, *vicarious experience* and *social persuasion* as interpersonal influence and, and *physiological and affective states* as activity-related affect (Srof & Velsor-Friedrich 2006). However, Srof and Velsor-Friedrich (2006) criticize the HPM for not illustrating the interpersonal influence as self-efficacy's source. Thus, below is presented the revised form of the HPM (Figure 2) in order to clarify the hierarchy of concepts related to exercise barriers and physical activity, and especially to highlight the effect of low self-efficacy as a barrier itself and its mediating effect on other elements of the model. Due to its strong association with physical activity, low self-efficacy is in this thesis regarded as a barrier to exercise.

The adapted Health Promotion Model proposes the following changes already justified in previous chapter to the original HPM (Figure 1):

1. Perceived benefits of action may influence the perceived barriers and vice versa.
2. Activity-related affect shapes not only self-efficacy but also both the perceived benefits and barriers.
3. Self-efficacy may impact the affective cues to the behavior and act as a barrier to physical activity in itself.
4. The interpersonal and situational influences shape activity-related affect, perceived efficacy, benefits and barriers.
5. Barriers demotivate behavior by affecting a person's willingness and perceived ability to perform, and thereby, decrease commitment.

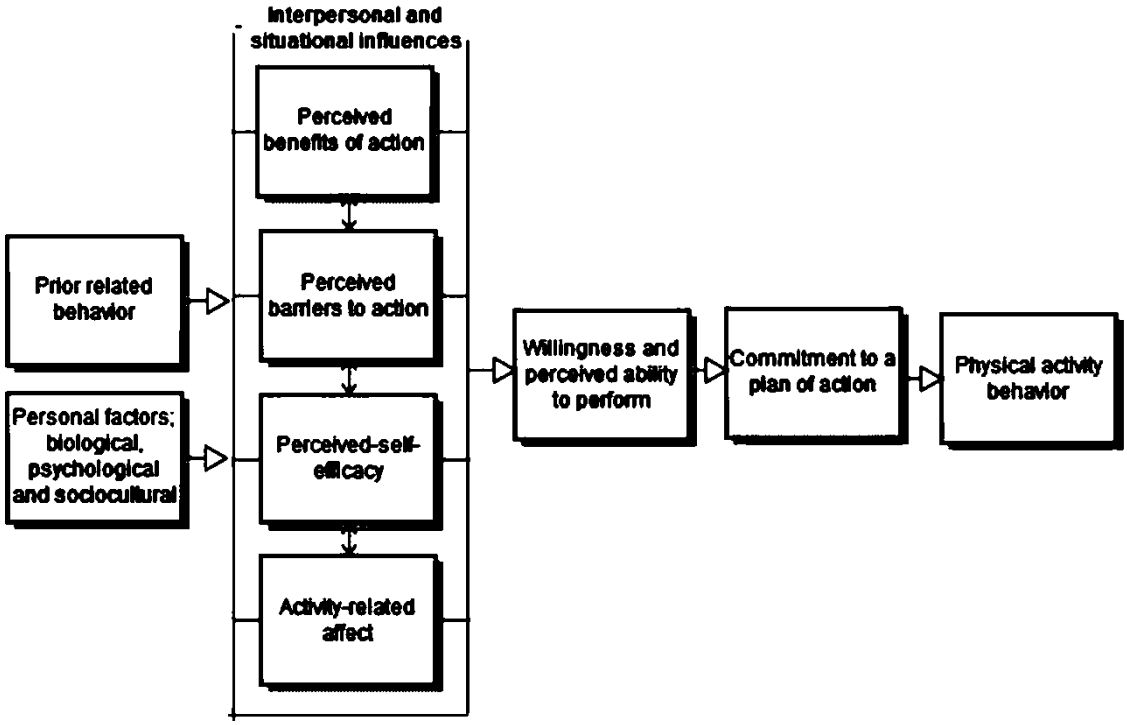

Figure 2 Revised Health Promotion Model (Adapted from Pender et al. 2005)

2.1.4 Barriers to exercise -framework

This chapter represents the framework summarizing the literature review on exercise barriers. Based on the barrier discussion, the below framework (Figure 3) depicts the major barrier dimensions by Higgins, Rickert and Nayor (2006), Timmerman (2007), Sallis, Prochaska and Taylor (2000), Trost et al. (2002) and McLeroy et al. (1988, cited in Gyurcsik et al. 2006). The frame also represents how the different barrier types relate to each other.

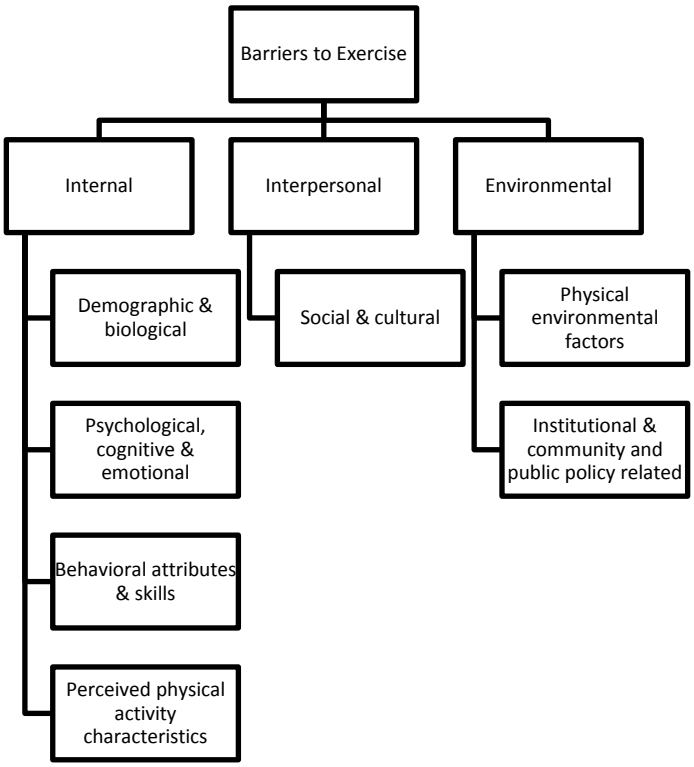

Figure 3 Barriers to exercise -framework

The above framework actually already encompasses the variables that the adapted HPM model (Figure 2) illustrated as strong correlates of exercise behavior: Self-efficacy, lack of perceived benefits or knowledge about them, activity-related affect and prior-related behavior. Self-efficacy and lack of perceived benefits are under psychological, cognitive

and emotional barriers; activity-related affect under physical activity characteristics; and prior-related behavior under behavioral attributes and skills.

When planning interventions to mitigate consumers' exercise barriers, the framework and the different barrier types (see section 2.1.1) can assist in weighting which barriers types can and should be targeted. The environmental, interpersonal and demographic and biological factors could be argued to require less consideration based on their invariable nature (Seefeldt, Malina & Clark 2002). First of all, physical environmental, public policy and community related barriers can be presumed to be modifiable but in this context can be thought as non-modifiable from an individual commercial service provider's perspective, and thus less interesting. Even though a marketer could alter for instance its opening times and prices of its services, neither are institutional barriers considered here because they are the most difficult factors to be changed by a commercial fitness and exercise service provider which needs to address not only consumer needs but also adhere to laws and competition. Also demographic and biological factors could be given less attention because of their non-modifiable nature. On the other hand, barriers such as age and gender cannot be "altered" but the barriers relating to them can. Hence, all sort of barriers well established in previous research are considered when it comes to the data analysis and interventions effect but the non-modifiable nature of certain barriers is useful to keep in mind.

2.2. Interventions to mitigate consumers' exercise barriers

In addition to identifying the perceived barriers to exercise, research has also noted the importance of identifying measures reducing or eliminating these barriers (e.g. Dunlap & Barry 1999). As was shown, barriers to exercise reduce physical activity levels by affecting one's willingness and perceived ability to exercise, and therefore, it is imperative to find ways of mitigating these barriers.

Interventions are part of experimental research in which a phenomenon is "intervened" in order to determine whether the manipulated, or intervened, factors had the intended effect on the study subject. Intervention research in exercise behavior is interested in causality

(Marcus 1995) and interventions have been widely used in promoting physical activity participation and adherence (Biddle & Mutrie 2008). For instance Brinthaupt, Kang and Anshel (2010) reported increased exercise behavior and reduced exercise barriers after a 10-week intervention program in which an exercise coach helped the participants to acknowledge incongruity between their values and actual behavior, and to follow an action plan. Dishman and Buckworth (1996) studied intervention effectiveness by meta analyzing over a hundred intervention studies the goal of which were to increase physical activity. The authors concluded that physical activity can be increased by interventions, while the question of how to maintain the increase by the selection of intervention components, settings, and population segments remained open. Overall, Dunn and Blair (2002) note that physical activity intervention studies are a relatively new field, first studies published merely three decades ago in 1980. The attention given to research promoting physical activity is important acknowledging the increasing level of inactivity and time spent on sedentary behaviors (Owen et al. 2010).

Consumers' physical activity level has been tried to increase with various types of interventions ranging from active to passive (Michie et al. 2009), from tailored to standard (Marcus 1995), from short-term to long-term (Maxwell et al 2002; Lindström et al. 2010), and from single-level to multi-level interventions (Glanz, Rimer & Viswanath 2008).

2.2.1 Different intervention types

Interventions in previous physical activity research have differed in the role the participant has: In active interventions the participants are engaged in the process of behavior change (e.g. exercising with personal trainer) whereas passive interventions do not require the participant to undertake any action but rather to be the object of for instance information provision (e.g. educational intervention) (Michie et al. 2009). For instance King et al.'s (2008) physical activity intervention had a self-directed behavioral approach: the underactive participants set personal physical activity goals and received feedback on their daily performance. This type of self-monitoring of behavior that requires active

engagement from the participant proved to be successful by significantly increasing the participants' physical activity levels when compared to the control group. In short, interventions that engage the participant and require self-regulatory processes are likely to be more efficient in physical activity promotion because sustained behavior changes are necessary to reach the health benefits (Michie et al. 2009). However, this intervention study by King et al. (2008), as well as most others, includes also a passive part with for instance physical activity education.

Interventions have also varied based on the level of personalization: An intervention could be tailored to an individual, or standardized to a group. However, most interventions are a mixture, standardized in wider scale and still tailored to some extent at individual level – an example being a community-wide or worksite- and physician-based intervention (Marcus 1995).

Previous intervention research aimed at increasing exercise behavior has concentrated on longer term intervention designs. Interventions may take from a single session (e.g. Maxwell et al. 2002) to multiple years (e.g. Lindström et al. 2010) but the short-term interventions have been claimed to lack the ability to achieve behavioral changes in the long-term. For instance Harland et al.'s (1999) comparison of intervention method effectiveness demonstrated that the most effective intervention for promoting exercise adoption was the most intensive one with 12-weeks contact, whereas the brief, single session intervention neither resulted in sustained short-term increases in activity nor in long-term lifestyle changes. The long-term interventions could be challenged by how to acknowledge the actual cause(s) for results. Furthermore, I would like to add that the objective of the intervention can have a major influence on the intervention duration, e.g. is the goal to teach physical activity related skills, to change attitudes or to promote adherence to the new lifestyle as in for instance losing weight.

Multi-level interventions, level here referring to the *target* of the intervention, influence more broadly on different levels from the policy and environmental changes to the individual: As previous studies have shown, physical activity behavior is influenced by factors from multiple domains, e.g. intrapersonal, interpersonal, organizational and community factors (Glanz, Rimer & Viswanath 2008). Hence, multi-level interventions

have been use to target several levels of influence. For instance Sallis et al. (2006) claim that multi-level interventions targeting individuals, social and physical environments and policies are necessary for achieving population change in physical activity. Single-level interventions, on the other hand, solely target one "level" (Glanz, Rimer & Viswanath 2008). Multi-level interventions have been claimed to be more effective than single-level interventions because single-level interventions are unlikely to have long-term, sustained population-wide effects whereas at multi-level interventions the different levels should support each other (Glanz, Rimer & Viswanath 2008). However, the related weakness with multiple levels is that obtaining funding and tracking and managing the interactions of different variables across levels is challenging (Glanz, Rimer & Viswanath 2008; Sallis et al. 2006)

Michie et al.'s (2009) review results on different techniques and designs used in physical activity interventions suggested that the delivery format and setting, with which the authors referred to the intervention level (e.g. individual vs. group, community vs. workplace), did not distinguish between effective and ineffective interventions. On the contrary, Sallis, Owen and Fisher (2008) insist that interventions with multiple levels influence have greater effect on health behavior change. Their claim is based on Ecological Models core thesis that health behavior has multiple, interacting levels, including intrapersonal, interpersonal, organizational, community and physical environmental and policy.

Approaches to intervention studies have typically ranged from personal, interpersonal, organizational, environmental and institutional to societal (King 1994 & 2001). Interventions using the levels of influence as a starting point are the most often used (e.g. Sallis et al. 2006). Another common practice is to base the intervention design on the delivery method of the intervention. For instance Marcus (1995) used the division into community-, physician- and worksite-based interventions, and Marcus et al. (2006) into healthcare settings, worksite, mediated (i.e. not through traditional face-to-face media, e.g. through Internet or telephone), physical environment (i.e. promoting physical activity by impacting environment; changes in environment "delivers" the intervention) and multiple behavior change interventions (e.g. delivering physical activity intervention vis-à-vis with healthy eating intervention).

Although most research in physical activity interventions have mostly relied on these aforementioned intervention types, for instance Kahn et al.'s (2002) review on physical activity interventions' effectiveness identified three, more practical types of interventions: information-based, behavioral and social, and environmental and policy interventions. Informational interventions aim at promoting physical activity by providing the information needed to choose and sustain healthier lifestyle; behavioral and social approaches aim to teach the necessary skills and provide motivation and support; and environmental and policy approaches seek to provide opportunities, support and cues to encourage physical activity (Kahn et al. 2002; Task Force on Community Preventive Services 2002). See also www.thecommunityguide.org/pa for a few interesting studies targeting aforementioned levels of influence.

Intervention research has often been criticized for lacking a theoretical framework based on which to examine intervention efficacy (Sallis & Owen 1999). A number of health behavior theories have been applied in physical activity interventions in order to find causalities between the underlying factors affecting exercise behaviors, also the role of perceived barriers in determining physical activity participation (Biddle & Mutrie 2008; Kang et al. 2007, 170; Seefeldt, Malina & Clark 2002).

Michie and Prestwich (2010) have acknowledged several benefits for the explicit use of theory in intervention design and evaluation: Theories for instance assist in identifying significant underlying constructs and in understanding why interventions are effective or ineffective. Regardless of the benefits of using theories to design interventions on, a substantial part of studies do not refer to, apply or test any theory (Michie & Prestwich 2010).

However, when theory is used, i.e. underlying factors and how these are to interact are addressed, often it is theories of health and exercise behavior and behavior change that have been used as frameworks for physical activity interventions (Biddle & Mutrie 2008; Glanz, Rimer & Viswanath 2008; Michie & Prestwich 2010). These theories differ on whether they are interested in individual or interpersonal factors (e.g. Health Belief Model vs. Social Cognitive Theory; Glanz, Rimer and Viswanath 2008), or whether the underlying factors relate to beliefs and attitudes (e.g. Theory of Planned behavior), perceptions of control and

competence (Self-efficacy Theory), or the stage of change (Transtheoretical Model) (Bidddle & Mutrie 2008, 36).

Originally the individual model of health behavior, Health Belief Model or HBM, was developed to explain and predict health behavior with the constructs of perceived susceptibility (motivation or health concern) and severity, and perceived benefits and barriers (Rosenstock, Strecher & Becker 1988). Even though the concepts of self-efficacy and perceived control were incorporated later, the model has been criticized for not being applicable in physical activity settings - the HBM is seen more suitable for "illness-avoidance" and preventive behaviors (Biddle & Mutrie 2008, 58).

Ajzen's Theory of Planned Behavior (an extension to Theory of Reasoned Action) states that one's subjective norms and attitude toward the behavior affect the intentions to perform specific actions, and that the intention together with perceived control over the action guide our behavior (Glanz, Rimer & Viswanath 2008). Just like the Health Belief Model, Theory of Planned Behavior is a value expectancy theory. Hence, the individual beliefs and attitudes held about the behavior and the outcomes expected (e.g. benefits) play an important role in behavior change. Furthermore, the Theory of Planned Behavior also partly incorporates the idea of interpersonality by acknowledging the concept of subjective norms, i.e. personal beliefs of significant others' approval or disapproval of the behavior.

Social cognitive theory is an interpersonal model of health behavior which states that our behavior is influenced not only by internal, self-reflective factors (especially self-efficacy) but also by social ties and expectancies (Biddle & Mutrie 2008). Hence, in order to be effective, the social cognitive model implies a more interpersonal and societal approach to interventions. What comes to self-efficacy and beliefs of one's competence and abilities, Bandura's Self-Efficacy Theory states that all four sources of self-efficacy, i.e. performance accomplishments, vicarious learning, verbal encouragement and physiological and affective states (see also section 2.1.3), are used to form a judgment of one's efficacy (Biddle and Mutrie 2008). Several physical activity interventions have applied these constructs of self-efficacy theory to promote physical activity adherence (Lee, Arthur & Avis 2008).

The Transtheoretical Model of behavior change, also known as Stages of Change Model, has contributed to the health behavior research by representing different phases of behavior change, which are acknowledging the individual's readiness to change (e.g. self-efficacy), and hence, assist in personalizing interventions and increasing the likelihood of achieving the wanted behavior change (Biddle & Mutrie 2008; Glanz, Rimer & Viswanath 2008).

According to Anshel and Kang (2007), previous intervention research has erroneously assumed that individuals desire a change in behavior whereas negative, deeply rooted habits are actually continued because of their perceived benefits - and the perceived barriers associated with the wanted behavior. The model of disconnected values states that health behavior change is based on inconsistencies in one's values, i.e. acknowledging that one's behavior is inconsistent with one's values and this disconnect is used as a motive for behavior change (Anshel & Kang 2007).

There are also a limited number of studies that have focused on the use of different types of persuasive appeals, or language specifically designed to exert influence upon some particular principle of conduct. The next section reviews the incorporation of persuasive appeals, and their use in exercise interventions.

2.2.2 Persuasive appeals in marketing interventions

Persuasion theory has been applied mostly within the fields of advertising and consumer behavior but more recently also to promote health behaviors (Jones, Sinclair & Courneya 2003). An appeal is the basic idea that the advertiser want to communicate to the audience, or the basic reason why the audience should react (Manrai, Broach & Manrai 1992, 46). There has been identified to be both negative and positive appeals, as well as rational and emotional appeals (e.g. Larson 2010; Manrai, Broach & Manrai 1992). Emotional appeals attempt to raise either negative (e.g. fear, guilt and shame appeals) or positive (e.g. love, humour and joy appeals) emotions that motivate certain behavior, whereas rational appeals attempt to relate to the audience's self-interest, i.e. that the offering produces the desired benefits (Manrai, Broach & Manrai 1992).

Persuasive appeals are often used in marketing communication's effect models and consumer response models when trying to encourage people to adopt and internalize attitudes (Corcoran 2007; Puto & Wells 1984). Attitudes are seen as a triadic with three components: cognitia, affect and behavior: Cognition refers to beliefs, affect to feelings, and behavior to approach or avoidance of the wanted behavior (Biddle & Mutrie 2008, 55). These components of attitude are here looked as responses which appeals are wished to evoke, i.e. cognitive appeals are used to create positive beliefs about physical activity, affective appeals to promote positive feelings and behavioral appeals to reinforce and increase wanted behavior.

According to Jones et al. (2004), few studies have adopted persuasion theory in designing exercise promoting interventions (cf. Jones, Sinclair & Courneya 2003). As attitude change is one of the most difficult aims of interventions promoting health behaviors (Corcoran 2007), the underlying concepts of cognitive, affective and behavioral appeals are set as the basis for classifying interventions respectively into cognitive, affective and behavioral exercise interventions.

Cognitive interventions. Information is here used as a synonym to cognition, which refers to mental processes. Puto and Wells (1984) state that informational advertising, or in this case informational appeals, provide consumers with factual, relevant data important to the consumer that focuses on features or benefits of the offering itself. Hence, informational interventions aim at changing knowledge and attitudes about the benefits of and opportunities for physical activity (Kahn et al. 2002, 75). Corcoran (2007, 48) highlights the different aspects of informational approach to health behavior change that need to be taken into account: The source credibility and prestige, and message relevancy – both in the eyes of the intervention participant. Also, Larson (2010) has emphasized the importance of credibility and relevancy of the source, message and channel used to deliver the persuasive appeal. In this thesis this has been acknowledged in the intervention designs by cooperating with a local entrepreneur and by having certified professionals to run the interventions.

Cognitive, or informational, appeals have been used in several physical activity interventions (e.g. Kahn et al. 2002; Kemper et al. 2002). This type of interventions typically includes education and mass media campaigns. For instance Kemper et al.'s

(2002) longitudinal intervention study was interested in the effects that medical check-ups with health information would have on physical activity determinants and levels. In contrary to the hypothesis, the long-term health information provision (feedback on medical check-ups and reference values by age and sex, health status based on individual lifestyle and biological risk characteristics as persuasive appeals) did not have a significant effect on physical activity level. Informational appeals have, however, also been successful: For example Kahn et al.'s (2002) review on physical activity interventions found several studies using informational appeals to be effective. The reviewed studies that aimed at motivating people to use stairs by placing prompt signs next to elevators increased physical activity as measured by an increase in the percentage of people choosing to take the stairs.

Affective interventions. Affective, or emotional appeals have been widely used in interventions trying to arouse negative emotions and eliminate health-compromising behaviors, for instance smoking and alcohol use (e.g. Keller & Block 1996; Moscato et al. 2001), but less so in physical activity promoting interventions (Conner et al. 2011). For instance Conner et al.'s (2011) study provided support for affective persuasive messages being more effective than cognitive messages in increasing exercise behaviors. The most often used appeals in interventions designed to change behavior are fear and guilt. However, the use of negative appeals has raised conflicting opinions, and also the effectiveness of negative, especially fear and threatening appeals has been claimed to be lower because of negative appeals being more likely rejected by consumers (Abraham & Michie 2008; Biddle & Mutrie 2008, 336). In the empirical study the affective intervention uses mostly positive appeals, i.e. supports and motivates exercise, whereas few negative queues are used to get the subjects to ponder *why* to exercise.

Behavioral and transformational interventions. Kahn et al. (2002, 75) state that behavioral approach to interventions attempt to teach people the behavioral management skills necessary for both successful adoption and maintenance of behavior change. This could be for instance about teaching specific skills, setting long-term behavioral patterns and goals or physical education classes and other supervised physical activity (Kahn et al. 2002; Marcus et al. 2006). In this thesis, the behavioral intervention includes teaching new skills whilst exercising with a personal trainer.

Puto and Wells' (1984) study on advertising effect based on the cognitive and affective elements of informational and transformational advertising claims that transformational advertising is highly experiential and hence essentially affect based. According to the authors, transformative appeals 'transform' the experience by associating the experience of consuming certain offering (or behavior) with a unique set of psychological characteristics. Transformational appeals have been defined as emphasizing the experience that consuming a good or service will provide the consumers with (Naylor et al. 2008, 50).

Table 2 depicts examples of physical activity intervention studies, the exercise barriers they were addressing, the underlying theory (if applicable) and their effectiveness.

There are also a great number of reviews of intervention studies in physical activity. For instance Kahn et al. (2002) has contributed to the research field by evaluating the effectiveness of informational, behavioral and social, and environmental and policy approaches to increasing physical activity.

In this thesis, I focus on whether and how perceived exercise barriers can be mitigated by interventions in the form of marketing practices available to commercial exercise and fitness service providers. As intervention effectiveness is the higher the better the intervention alters the underlying variables that influence physical activity behavior (Trost et al. 2002), the theories applied need to be appropriate regarding the phenomenon, object and unit of practice (e.g. individuals vs. groups) (Glanz, RImer & Viswanath 2008): An individual with only certain barriers to exercise is less likely to change physical activity behavior when targeted with an intervention not addressing those barriers. Thus, the sub-objective of this thesis was to examine whether any patterns emerge of certain intervention types having greater impact on certain barriers.

Based on the discussion of intervention types above, the importance of multi-level and interpersonal interventions on intervention efficacy was well acknowledged. The idea behind Transtheoretical model is very attractive, but requires an individually personalized approach and hence is not exactly feasible for a marketer of exercise services.

Therefore, the empirical part of this thesis is based on the marketing appeals built on the three constructs of attitude, one of the most consequential and challenging factor

Author(s) and study	Intervention / Study objective & design	Addressed barriers	Theory used	Findings
Brinthaupt, Kang & Anshel 2010: 'A delivery model for overcoming psycho-behavioral barriers to exercise'	Determining the effects of a value-based wellness intervention on physical fitness and perceived barriers to exercise	Psycho-behavioral	Disconnected Values Model	Participants reported improved fitness scores, significant reductions in perceived barriers to exercise and a drop in the total number of barriers endorsed. Reasons for exercising were less affected by internal and personal barriers (e.g. lack of time and confidence). Barriers not showing significant changes included external barriers such as lack of support from others, too expensive, and no close access to an exercise facility, and internal barrier of finding exercise unpleasant.
Lee, arthur and Avis 2008: 'Using self-efficacy theory to develop interventions that help older people overcome psychological barriers to physical activity: A discussion paper'	Examining the ways in which Self-Efficacy Theory might be used in intervention programmes designed to overcome psychological barriers for increasing physical activity among older people	Psychological, exercise self-efficacy	Self-Efficacy Theory	Evidence from some trials supports the view that incorporating the theory of self-efficacy into the design of a physical activity intervention is beneficial. Physical activity interventions aimed at improving the self perception of exercise self-efficacy can have positive effects on confidence and the ability to initiate and maintain physical activity behaviour.
Ransdell et al. 2004: 'Can Physical Activity Interventions Change Perceived Exercise Benefits and Barriers?'	Studying the changes in physical activity and exercise barriers in women (mothers and daughters) participating in 12-week home and university-based interventions	Not specified	None	Both mothers and daughters reported increased physical activity. Mothers also reported decreased exercise barriers in both groups, whereas for daughters the exercise barriers did not change.
Rimmer et al. 2010: 'Barrier Removal in Increasing Physical Activity Levels in Obese African American Women with Disabilities'	Examining the effectiveness of a 6-month telephone-based intervention to increase physical activity by targeting the removal of barriers	Personal and environmental barriers to physical activity participation	None, motivational interviewing techniques used	Significant increases in physical activity. No significant changes in environmental/facility barriers and the total number of reported barriers. Significant decreases in the total number of personal barriers: two key personal barriers that were significantly decreased were 'don't know how to exercise' and 'don't know where to exercise'.
Ziebland et al. 1998: 'Lack of willpower or lack of wherewithal? "internal" and "external" barriers to changing diet and exercise in a three year follow-up of participants in a health check'	Assessing whether anticipated barriers to change in diet and exercise which were cited before a health check intervention were related to subsequent behaviour changes	Internal and external	None	Participant who only gave internal anticipated barriers to taking more exercise were less likely to make positive changes than those who also recognized external reasons.

Table 2 Examples of physical activity intervention studies

underlying exercise behaviors (Corcoran 2007). As previous research has focused on lengthy and costly intervention practices such as six months of personal training, it is essential to assess the effectiveness of shorter term, group-based interventions. Due to the lack of empirical research on the efficacy of short-term, marketer staged interventions built on marketing appeals, this thesis' aim is to find out how marketing practices feasible to a commercial exercise service provider could be used to mitigate perceived barriers to exercise.

3. Research methods

Intervention research in exercise behavior is often experimental and is interested in causality (Marcus 1995). The experimental design is well suited for the purposes of this thesis as pre- and post-test measurements are needed in order to see whether the interventions had the intended effect on perceived barriers. Hence, a quantitative research approach was chosen.

The purpose of the empirical part is to identify the participants' perceived barriers to exercise by conducting a survey. Further, the interventions and the post-intervention survey are used to finding underlying patterns of whether certain interventions mitigate certain barriers most efficiently. Taking into consideration the limited amount of post-intervention data that was gathered, in this thesis these post-intervention measures are interpreted in order to establish grounds for further studies, not to draw statistically significant conclusions. Thus, the weight is on pre-intervention survey data analysis.

This study employs a pre-test-post-test design, in which participants, subject to one of the three given interventions promoting physical activity (cf. Biddle and Mutrie 2008), complete a pre- and post-intervention survey which evaluates a variety of perceived barriers to exercise. The study is carried out in the following three stages:

1 *Pre-intervention and preliminary screening*. A large scale web-based barriers inventory survey is conducted in order to examine the different levels of barriers, after which identified non-exercisers will be asked to participate in interventions.

2 *Intervention*. Different fitness service provider administrated interventions promoting physical activity (fitness test, group discussion with a life coach on how to embrace a healthier lifestyle, workout with personal trainer) are carried out.

3 *Post-intervention*. Participants are asked to refill the barriers inventory survey in order to get the post-test measures for barriers.

The study is carried out in cooperation with a private fitness service provider, who administrates the interventions. Participants are recruited through the service provider's

mailing list consisting of consumers who have at some time ended their membership, or have visited the facility but never became members. Only those respondents who self-identify as non-exercisers (exercising 1-2 times a week or more seldom, and hence, not meeting the requirements of adequate physical activity) are asked to participate in interventions.

3.1. Collecting the data

Barrier inventory survey

A web-based questionnaire was carried out by using a private exercise service provider's mailing list of 1961 subjects that do not currently have a membership in the facility. All the subjects who completed the survey entered a draw of a gift card to a local spa mansion. Further, the service provider offered a 30-day card to their facilities free of charge for all those taking part in the survey. In addition, two reminders were sent at one-week intervals to achieve as high response rate as possible.

The barrier survey questionnaire was designed to cover the respondent's current level of physical activity and background information, perceived benefits from exercising (29-item scale adopted from Sechrist, Walker and Pender (1987)), perceived barriers to exercise (14-item scale adopted from Sechrist et al. (1987)), 11 items from Barriers to Being Active Quiz by the U.S. Department of Health & Human Services (1999), 6 additional items complementing some key barrier types that the aforementioned scales lacked, and contact details.

The analysis of the pre-intervention survey data consists of two parts: 1) analyzing the perceived benefits and barriers, and examining the barrier items' underlying structures, and 2) clustering the respondents based on the different types of perceived barriers.

The survey was designed to comprehensively measure the different constructs and factors presented in the revised HPM (Figure 2) and the barriers to exercise -framework (Figure 3). Most of the items included in the questionnaire are adopted from previous research

(Sechrist, Walker & Pender 1987; U.S. Department of Health and Human Services 1999), and hence, are already validated. The translations from English to Finnish were validated by proofreading the questions. Proofreading was done by going through each item's meaning with a native English speaker and by translating the questionnaires from English to Finnish and back.

The barrier items formed different groupings around the major barrier themes in the literature: Exercise milieu, time expenditure, physical exertion and family discouragement (Sechrist, Walker & Pender 1987). From U.S. Department of Health and Human Services' (1999) Barriers to Being Active -quiz, the factors of lack of willpower and lack of skills were added. Also, the social influence factor and the lack of energy factor (suppressed into one item to avoid repetition due to the similarity of the original questions) were added to complement the aforementioned themes of family discouragement and physical exertion. Furthermore, the factor of fear of injury was summarized in one item as, in my opinion, the barrier is not as prominent in this study as it was for U.S. Department of Health and Human Services (1999) as they most likely targeted older adults with their questionnaire. Lastly, some items that both of the above-mentioned scales lacked were introduced: Single items were created to represent previous physical activity and self-efficacy (Pender, Murdaugh & Parsons 2005), physical environmental factor of weather/season (e.g. Sallis, Prochaska and Taylor 2000), lack of interest in exercise (Adachi-Mejia et al. 2010), and lack of confidence and finding exercise unpleasant (Brinthaupt, Kang & Anshel 2010).

Also, benefit items on the themes of life enhancement, physical performance, psychological outlook, social interaction and preventive health were included (Sechrist, Walker & Pender 1987). As the analysis strongly focuses on the barriers to exercise, benefit items were added in order to make the questionnaire less "negative" towards exercise. Further, the analysis of benefit items alongside the barriers could come along with some interesting insight.

The multi-choice questionnaire was pilot-tested in small scale: Ten members of a "Start exercising" ("Lähde liikkumaan") group that I was instructing at the time filled in the questionnaire and gave open feedback on the overall feeling of the questionnaire, response option adequacy and suitability, and question formulation. In response to their comments the questionnaire's scale was extended to cover more options for respondents to specify

their level of agreement or disagreement with the statements: A seven-point scale was incorporated instead of the four-point scales introduced by U.S. Department of Health & Human Services (1999) and Sechrist, Walker and Pender (1987). Further, some questions' wording was clarified. The final web-based questionnaire and its English translation are presented in Appendix A.

Intervention procedures

Out of the 362 respondents who took part in the initial barrier inventory survey, 220 were part of the target group, i.e. could be defined as non-exercisers, and could be asked to participate in the interventions. In the context of this empirical research, all those exercising 1-2 times a week or more seldom were treated as "non-exercisers". These non-exercisers who had filled in the preliminary questionnaire their contact details were contacted personally over the phone and invited to participate in the experiment. Of the 220 identified non-exercisers 34 agreed and were subjected to one of the three intervention groups.

The interventions were designed and organized in cooperation with a local gym in order to make sure they truly correspond to means available to commercial exercise and fitness service marketers and government organizations on wider scale. Moreover, all the interventions were short-term, consisting of a single contact session. Immediately after the intervention, participants were asked to refill the questionnaire.

The intervention treatment groups were built around three major constructs: Cognitia, affect and behavior. Cognitive or "rational" intervention was designed to be a fitness test that would provide the study participants with detailed information of their current state of fitness. Two qualified fitness instructors held a short, 30-minute fitness test, and handed out statistics showing how the participants compare to the nationwide fitness level. The participants were then encouraged to freely discuss their results with the fitness instructors.

The intervention method used for the affect was a discussion based on "Method Mentra" led by an experienced life coach. The method is about mental training that is aimed at changing long-rooted habits that are not in line with ones values - such as eating

unhealthily and averting exercise. Similar, more "psychological" services are provided under different names, e.g. Weight Watchers and personal trainers giving mental support. In order to avoid an informative session, the groups were kept small (max. 10 persons) and the participants were encouraged to have an active participation in the discussion. The appeals were kept positive – No fear, for instance, was used as an appeal.

The behavioral or transformational intervention condition required the participant to take part in actual physical activity. A demo class of Fusion Function Training, or 'Fustra' method was given by two qualified Fustra personal trainers. Fustra is a new functional training method which none of the participants had tried before.

If we go back to the different intervention types, two of the interventions selected here, physical fitness test and Fustra demo class, are active in that they require the physical participation of the study subject. Depending on the activity of the subject, also Method Mentra encouraged people to take part in the discussion, but when compared with the other two interventions, this is definitely more likely to be categorized as a passive intervention. Looked from a different perspective, all the interventions were highly tailored – even though the interventions were designed for a group of people, the groups were kept small and each participant was taken into account as an individual. With the physical activity test, the test itself was highly standardized, but each participant had the opportunity to get personal feedback. Similarly, at Fustra demo class the personal trainers held the same, standardized class to all, but circulated around and helped each individual personally with technique, possible injuries requiring attention etc. At Method Mentra, the discussion was shaped based on the participants interests and own input and response. Regarding the level of influence, the intervention designs could be regarded as multi-level: The interventions were aimed at targeting the individuals as personally as possible, but at the same time kept interpersonal and more feasible for the commercial fitness service provider by having a group of people attending. As was already stated before, the interventions targeting only individuals are likely to be less successful in promoting sustained behavior or attitude change.

The aim of the pre-test-post-test design was to examine whether the interventions impact the perceived level of the barriers and whether there are any emerging patterns of certain

intervention types having greater impact on certain barriers. The questionnaire that the subjects were asked to fill again was identical to the one in Appendix A with the exception that the post-intervention questionnaire was a paper survey.

3.2. Research Data

The original survey invitation was sent to 1961 subjects, while 671 e-mail addresses never received the invitation to participate in the study (undeliverable because of incorrect e-mail address, local error in processing etc.). This denotes that 1290 recipients had the opportunity to participate. After the survey period of 10 - 27 April 2012, the survey data collected included 362 responses, corresponding to a response rate of 28.06 %.

Basic background statistics: Respondents by age, gender and physical activity level

The respondents are first described in terms of age and gender. The cross-tabulation in Table 3 indicates that vast majority of the respondents were females in all of the age categories. Males were best represented in the 40-49 year-old category, where 25.4 % of the respondents were males.

			Age				Total
			18-29	30-39	40-49	Over 50	
Sex	Female	Count	43	60	85	96	284
		% within Age	87,8%	80,0%	74,6%	77,4%	78,5%
	Male	Count	6	15	29	28	78
		% within Age	12,2%	20,0%	25,4%	22,6%	21,5%
Total		Count	49	75	114	124	362
		% within Age	100,0%	100,0%	100,0%	100,0%	100,0%

Table 3 Cross-tabulation between respondents' age and sex.

Table 4 illustrates the respondents' distribution by level of physical activity.

Level of physical activity		
	Frequency	**Percent**
5+ times a week	26	7,2
3-4 times a week	116	32,0
1-2 times a week	122	33,7
3-4 times a month	30	8,3
1-2 times a month	23	6,4
Less frequently than once a month	38	10,5
Never	7	1,9
Total	362	100

Table 4 Respondents according to physical activity level.

The respondents' physical activity level is examined in relation to both sex and age. Table 5 indicates that majority of females (35.9 %) exercise 1-2 times a week whilst most men (34.6 %) seem to exercise 3-4 times a week. This is in line with Allison et al.'s (2005) argument that women are less involved in exercise than males. However, analysis of variance (ANOVA), a method used to compare means between groups, was run in order to test the null hypothesis of equal variances (Hair et al. 2010, 444) and revealed that the variances are equal [small F value (.106) and non-significant p value (.745)]. Thus, we cannot say that physical activity level varies between male and female gender.

Solely 1.9 % of all respondents stated that they never exercise.

When looking at the respondents' age distribution along the physical activity levels (Table 6), it is easy to note that the majority in all age categories exercise one to four times a week. Of the respondents who stated that they exercise never, 57.1 % are in their 50s or older, and an astonishing 0 % are young adults, 18-29 year-olds. However, nearly 65 % of the respondents in the oldest age segment exercise 1-2 times a week or more regularly. We can also note that a good third (33.7 %) of all the respondents exercise 1-2 times a week and nearly another third (27.1%) exercise less frequently. Hence, nearly two thirds of the respondents do not attain the recommended amount of daily exercise.

			Physical activity level							Total
			5 times a week or more often	3-4 times a week	1-2 times a week	3-4 times a month	1-2 times a month	Less frequently than once a month	Never	
Sex	Female	Count	19	89	102	19	20	29	6	284
		% within Sex	6,7%	31,3%	35,9%	6,7%	7,0%	10,2%	2,1%	100%
		% within Physical activity level	73,1%	76,7%	83,6%	63,3%	87,0%	76,3%	85,7%	78,5%
		% of Total	5,2%	24,6%	28,2%	5,2%	5,5%	8,0%	1,7%	78,5%
	Male	Count	7	27	20	11	3	9	1	78
		% within Sex	9,0%	34,6%	25,6%	14,1%	3,8%	11,5%	1,3%	100%
		% within Physical activity level	26,9%	23,3%	16,4%	36,7%	13,0%	23,7%	14,3%	21,5%
		% of Total	1,9%	7,5%	5,5%	3,0%	,8%	2,5%	,3%	21,5%
Total		Count	26	116	122	30	23	38	7	362
		% within Sex	7,2%	32,0%	33,7%	8,3%	6,4%	10,5%	1,9%	100%
		% within Physical activity level	100%	100%	100%	100%	100%	100%	100%	100%
		% of Total	7,2%	32,0%	33,7%	8,3%	6,4%	10,5%	1,9%	100%

Table 5 Cross-tabulation between respondents' sex and level of physical activity.

			Level of physical activity							Total
			5+ times a week	3-4 times a week	1-2 times a week	3-4 times a month	1-2 times a month	Less frequently than once a month	Never	
Age	18-29	Count	8	24	10	3	1	3	0	49
		% within Age	16,3%	49,0%	20,4%	6,1%	2,0%	6,1%	0,0%	100,0%
		% within Level of physical activity	30,8%	20,7%	8,2%	10,0%	4,3%	7,9%	0,0%	13,5%
	30-39	Count	3	27	20	10	2	12	1	75
		% within Age	4,0%	36,0%	26,7%	13,3%	2,7%	16,0%	1,3%	100,0%
		% within Level of physical activity	11,5%	23,3%	16,4%	33,3%	8,7%	31,6%	14,3%	20,7%
	40-49	Count	10	39	43	8	3	9	2	114
		% within Age	8,8%	34,2%	37,7%	7,0%	2,6%	7,9%	1,8%	100,0%
		% within Level of physical activity	38,5%	33,6%	35,2%	26,7%	13,0%	23,7%	28,6%	31,5%
	Over 50	Count	5	26	49	9	17	14	4	124
		% within Age	4,0%	21,0%	39,5%	7,3%	13,7%	11,3%	3,2%	100,0%
		% within Level of physical activity	19,2%	22,4%	40,2%	30,0%	73,9%	36,8%	57,1%	34,3%
Total		Count	26	116	122	30	23	38	7	362
		% within Age	7,2%	32,0%	33,7%	8,3%	6,4%	10,5%	1,9%	100,0%
		% within Level of physical activity	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%

Table 6 Cross-tabulation between respondents' age and level of physical activity

ANOVAs null hypothesis was rejected (F (7.681), p = .000), and hence, the respondents' physical activity level significantly differs across the age groups. On the scale from 1 (exercise 5 times a week or more frequently) to 7 (exercise never), highest activity mean (2.47) was reported for 18-29 year-olds and lowest activity mean (3.52) for over 50 year-olds. Again, this supports previous research (e.g. Trost et al. 2002), and denotes that age

could possibly be used in building exercise profiles or as a queue to physical activity level and possibly even the level of perceived barriers.

Missing value analysis

A scale from one (totally disagree) to six (totally agree) was used for the benefit and barrier items. Hence, the higher the score, the higher the perceived benefit or barrier is. In analyzing the perceived barriers and benefits, the 7, or "I do not know" option was defined as a user missing value in order to avoid data distortion. As the pre-intervention data was gathered via an online questionnaire, the respondent could not leave mandatory fields blank before moving on, and therefore there were no system missing values. Hence, below in Table 7 are presented the results for the pre-intervention data missing value analysis, which indicates what type of questions resulted in most "I do not know" answers.

Interestingly, benefit items seemed to reach higher missing values: Items of 'exercising will keep me from having high blood pressure', 'exercise increases my stamina', 'my disposition is improved with exercise', 'I will live longer if I exercise', 'exercising improves my self-concept', 'exercising improves the quality of my work' and 'exercising increases my acceptance by others' had 5 % or more values missing. The higher amount of "I do not know" responses could be explained by these items being harder to grasp by the respondents. From the barrier items only 'exercise facilities do not have convenient schedules for me', 'there are too few places for me to exercise' and 'I feel insecure' had more than 2 % of values missing (Table 7).

Due to the fact that the post-intervention questionnaire was filled on paper, the subjects were susceptible to miss questions. According to Hair et al. (2010, 47), missing values under 10 % for individual case or observation can be ignored. Of the 31 barrier items, only one, "I do not like exercising", had over 10 % of missing values (11.8 %). The missing values tend to accumulate towards the end of the questionnaire (see Table 8). However, acknowledging the relatively small sample for post-intervention (N = 34), imputation was deemed necessary to ensure that missing values would not limit the generalizability of the findings. Therefore, the system missing values were first imputed, and after the "I do not

know" answers were treated similarly as in the pre-intervention data - defined as user-missing. Even though the analysis of the benefit items could add interesting insight to the research findings, only barrier variables are discussed in the post-intervention context due to the nature and focus of the study.

The most suitable imputation method used with the post-intervention data depends on whether the values are missing at random (MAR) or completely at random (MCAR) (Hair et al. 2010, 50-51). Little's MCAR test, a statistic for testing whether missing values are MCAR, was run and resulted in a chi-square of 85.367 ($df = 82$, $p = .378$). The result was not significant, and thus, the null hypothesis of the data missing completely at random (MCAR) was accepted. In other words, the missing values do not depend on the data values. For data missing completely at random, there are multiple imputation methods available. Defining replacement values for the missing values with regression imputation was deemed most appropriate as it employs the actual relationships among the barrier variables when predicting missing values (Hair et al. 2010, 54). The method has been criticized for assuming and reinforcing the existing relationships in the data and for resulting in out-of-range values. As we will see later in factor analysis, the relationships between the variables are sufficiently established not to impact the existing relationships. As for the out-of-range values, only few missing values were replaced by SPSS with a 0. These were manually changed to the nearest within-range value, 1.

After the imputation, the "7", or I do not know -options were defined as user-missing. These could have imputed as well, but were not in order to avoid data distortion especially because it was the certain items that resulted in most "7" responses. As with the pre-intervention survey, barrier items of 'exercise facilities do not have convenient schedules for me' and 'there are too few places for me to exercise' resulted in most "I do not know" answers post-intervention (5.9 %).

	Items	N	Missing	
			Count	Percent
BENEFITS	I enjoy exercise.	361	1	,3
	Exercise decreases feelings of stress and tensions for me.	359	3	,8
	Exercise improves my mental health.	361	1	,3
	I will strengthen my heart by exercising.	355	7	1,9
	Exercise improves my muscle strength.	361	1	,3
	Exercise gives me a sense of personal accomplishment.	355	7	1,9
	Exercising makes me feel relaxed.	358	4	1,1
	Exercising lets me have contact with friends and persons I enjoy.	352	10	2,8
	Exercising will keep me from having high blood pressure.	336	26	7,2
	Exercising increases my level of physical fitness.	354	8	2,2
	My muscle tone is improved with exercise.	351	11	3,0
	Exercising improves functioning of my cardiovascular system.	348	14	3,9
	I have improved feelings of well being from exercise.	348	14	3,9
	Exercise increases my stamina.	344	18	5,0
	Exercise improves my flexibility.	353	9	2,5
	My disposition is improved with exercise.	340	22	6,1
	Exercising helps me sleep better at night.	345	17	4,7
	I will live longer if I exercise.	310	52	14,4
	Exercise helps me decrease fatigue.	354	8	2,2
	Exercising is a good way for me to meet new people.	346	16	4,4
	My physical endurance is improved by exercising.	354	8	2,2
	Exercising improves my self-concept.	331	31	8,6
	Exercising increases my mental alertness.	345	17	4,7
	Exercise allows me to carry out normal activities without becoming tired.	347	15	4,1
	Exercising improves the quality of my work.	342	20	5,5
	Exercise is good entertainment for me.	352	10	2,8
	Exercising increases my acceptance by others.	325	37	10,2
	Exercise improves overall body functioning for me.	354	8	2,2
	Exercise improves the way my body looks.	348	14	3,9
BARRIERS	Exercising takes too much time.	361	1	0,3
	Exercise tires me.	361	1	0,3
	Places for me to exercise are too far away.	359	3	0,8
	I am too embarrassed to exercise.	360	2	,6
	It costs too much to exercise.	358	4	1,1
	Exercise facilities do not have convenient schedules for me.	348	14	3,9
	I am fatigued by exercise.	361	1	,3
	My spouse (or significant other) does not encourage me to exercise.	356	6	1,7
	Exercise takes too much time from family relationships.	358	4	1,1
	I do not like the way I look in exercise clothes.	359	3	,8
	My family members do not encourage me to exercise.	360	2	,6
	Exercise takes too much time from my family responsibilities.	361	1	,3
	Exercise is hard work for me.	360	2	,6
	There are too few places for me to exercise.	353	9	2,5
	I've been thinking about getting more exercise, but I just can't seem to get started.	359	3	,8
	It's easier for me to find excuses not to exercise than to go out to do something.	358	4	1,1
	I can't make myself stick to my decision of being physically more active	358	4	1,1
	Exercise can be risky so I am afraid I might get hurt.	362	0	0,0
	I have never learned the skills for any sport.	360	2	,6
	I really can't see learning a new sport.	360	2	,6
	I'm not good enough at any physical activity to make it fun.	359	3	,8
	I have no one to exercise with.	362	0	0,0
	I'm embarrassed about how I will look when I exercise with others.	359	3	,8
	My usual social activities with family or friends do not include physical activity.	361	1	,3
	I'm just too tired after my daily routines to get any exercise.	362	0	0,0
	I feel insecure.	353	9	2,5
	I do not like exercising.	358	4	1,1
	Exercising is of no interest to me.	359	3	,8
	I do not think I have what it takes to exercise.	361	1	,3
	I did not exercise at younger age either.	362	0	0,0
	Finnish weather does not encourage me to exercise.	355	7	1,9

Table 7 Pre-intervention missing value analysis. 'I do not know' defined as user-missing.

Barrier item	N	Missing	
		Count	Percent
Exercising takes too much time.	33	1	2,9
Exercise tires me.	33	1	2,9
Places for me to exercise are too far away.	33	1	2,9
I am too embarrassed to exercise.	33	1	2,9
It costs too much to exercise.	33	1	2,9
Exercise facilities do not have convenient schedules for me.	33	1	2,9
I am fatigued by exercise.	33	1	2,9
My spouse (or significant other) does not encourage me to exercise.	33	1	2,9
Exercise takes too much time from family relationships.	33	1	2,9
I do not like the way I look in exercise clothes.	33	1	2,9
My family members do not encourage me to exercise.	33	1	2,9
Exercise takes too much time from my family responsibilities.	33	1	2,9
Exercise is hard work for me.	33	1	2,9
There are too few places for me to exercise.	33	1	2,9
I've been thinking about getting more exercise, but I just can't seem to get started.	33	1	2,9
It's easier for me to find excuses not to exercise than to go out to do something.	32	2	5,9
I can't make myself stick to my decision of being physically more active	32	2	5,9
Exercise can be risky so I am afraid I might get hurt.	32	2	5,9
I have never learned the skills for any sport.	32	2	5,9
I really can't see learning a new sport.	32	2	5,9
I'm not good enough at any physical activity to make it fun.	32	2	5,9
I have no one to exercise with.	31	3	8,8
I'm embarrassed about how I will look when I exercise with others.	31	3	8,8
My usual social activities with family or friends do not include physical activity.	31	3	8,8
I'm just too tired after my daily routines to get any exercise.	31	3	8,8
I feel insecure.	31	3	8,8
I do not like exercising.	30	4	11,8
Exercising is of no interest to me.	31	3	8,8
I do not think I have what it takes to exercise.	31	3	8,8
I did not exercise at younger age either.	31	3	8,8
Finnish weather does not encourage me to exercise.	31	3	8,8

Table 8 Post-intervention missing value analysis.

Pre-intervention perceived barriers and benefits

Table 9 shows the pre-intervention barrier items' means and standard deviations.

BARRIER	Mean	Std. Deviation
Exercising takes too much time.	2,98	1,339
Exercise tires me.	2,18	1,232
Places for me to exercise are too far away.	2,67	1,449
I am too embarrassed to exercise.	1,79	1,120
It costs too much to exercise.	2,78	1,529
Exercise facilities do not have convenient schedules for me.	2,24	1,234
I am fatigued by exercise.	1,86	1,092
My spouse (or significant other) does not encourage me to exercise.	2,11	1,366
Exercise takes too much time from family relationships.	2,80	1,521
I do not like the way I look in exercise clothes.	2,15	1,445
My family members do not encourage me to exercise.	2,04	1,385
Exercise takes too much time from my family responsibilities.	2,41	1,347
Exercise is hard work for me.	2,19	1,266
There are too few places for me to exercise.	1,97	1,181
I've been thinking about getting more exercise, but I just can't seem to get started.	3,37	1,717
It's easier for me to find excuses not to exercise than to go out to do something.	3,61	1,705
I can't make myself stick to my decision of being physically more active	3,19	1,651
Exercise can be risky so I am afraid I might get hurt.	1,72	1,097
I have never learned the skills for any sport.	1,98	1,330
I really can't see learning a new sport.	1,82	1,130
I'm not good enough at any physical activity to make it fun.	1,85	1,246
I have no one to exercise with.	2,39	1,593
I'm embarrassed about how I will look when I exercise with others.	1,88	1,297
My usual social activities with family or friends do not include physical activity.	2,30	1,412
I'm just too tired after my daily routines to get any exercise.	2,98	1,561
I feel insecure.	2,07	1,316
I do not like exercising.	1,78	1,180
Exercising is of no interest to me.	1,70	1,085
I do not think I have what it takes to exercise.	1,63	1,091
I did not exercise at younger age either.	1,99	1,471
Finnish weather does not encourage me to exercise.	2,08	1,400

Table 9 Descriptives on pre-intervention barrier items

As we can note, the highest barriers to exercise for the respondents were 'exercising takes too much time', I've been thinking about getting more exercise, but I just can't seem to get started', 'it's easier for me to find excuses not to exercise than to go out to do something', 'I can't make myself stick to my decision of being physically more active' and 'I'm just too tired after my daily routines to get any exercise'. These items relating to the themes of lack of time and feeling of indolence the respondents agreed most strongly with. There were statistically significant differences in the perceived barriers between exercisers and non-exercisers. It is prominent from Appendix B that non-exercisers means for barrier items are consistently higher. Actually, analysis of variance verified that 29 out of the 31 barrier

items statistically significantly differed at the 0.5 level between exercisers and non-exercisers (Appendix B-2). This is in line with Kowal and Fortier's (2007) claim that physically active people experience fewer barriers when compared to the physically inactive. This already shows preliminary indication that the information about consumers' level of physical activity and perceived barriers may help in segmentation in order to better target marketing interventions. Also, for non-exercisers the standard deviation from the mean seems to be higher with most barrier items. Taking into account that to non-exercisers were also included those exercising once or twice a week (minimum of 30 minutes of "real" physical activity at a time, twice a week, is not exactly inactive), the less consistent division could be expected. Correspondingly, Table 10 shows the means for the benefit items. The lowest benefits with a mean score under 4 were 'exercising lets me have contact with friends and persons I enjoy', 'exercising is a good way for me to meet new people' and 'exercising increases my acceptance by others', which all are social factors (Sechrist, Walker & Pender 1987). Hence, the lack of perceived social benefits or their irrelevancy to the consumer could strengthen the perceived barriers to exercise (see discussion in section 2.1.2) or act as a barrier to exercise in itself.

BENEFIT	Mean	Std. Deviation
I enjoy exercise.	5,08	1,105
Exercise decreases feelings of stress and tensions for me.	5,23	,935
Exercise improves my mental health.	5,32	,943
I will strengthen my heart by exercising.	5,38	,920
Exercise improves my muscle strength.	5,39	,906
Exercise gives me a sense of personal accomplishment.	5,03	,987
Exercising makes me feel relaxed.	5,06	,983
Exercising lets me have contact with friends and persons I enjoy.	3,86	1,440
Exercising will keep me from having high blood pressure.	4,86	1,250
Exercising increases my level of physical fitness.	5,56	,773
My muscle tone is improved with exercise.	5,36	,805
Exercising improves functioning of my cardiovascular system.	5,43	,795
I have improved feelings of well being from exercise.	5,41	,818
Exercise increases my stamina.	4,75	1,108
Exercise improves my flexibility.	5,25	,939
My disposition is improved with exercise.	4,57	1,133
Exercising helps me sleep better at night.	5,05	1,027
I will live longer if I exercise.	5,02	1,022
Exercise helps me decrease fatigue.	4,91	1,036
Exercising is a good way for me to meet new people.	3,60	1,459
My physical endurance is improved by exercising.	5,38	,830
Exercising improves my self-concept.	4,49	1,297
Exercising increases my mental alertness.	5,15	,940
Exercise allows me to carry out normal activities without becoming tired.	5,05	,931
Exercising improves the quality of my work.	4,59	1,180
Exercise is good entertainment for me.	4,66	1,293
Exercising increases my acceptance by others.	3,35	1,427
Exercise improves overall body functioning for me.	5,26	,867
Exercise improves the way my body looks.	5,12	1,010

Table 10 Descriptives on pre-intervention benefit items

3.3. Statistical analysis methods

Two multivariate techniques were applied in analyzing the pre-intervention survey data. First, exploratory factor analysis was conducted in order to identify underlying patterns in the perceived barriers to exercise. Second, cluster analysis was performed to categorize the subjects based on the perceived barriers.

3.3.1 Factor analysis

Factor analysis denotes a class of procedures primarily used for data reduction and summarization (Malhotra & Birks 2007, 646). Its primary purpose is to define the underlying structure among the variables (Hair et al. 2010, 94). These structures determine a few underlying factors that represent relationships among the highly interrelated variables (Malhotra & Birks 2007, 646). In the present study, factor analysis is conducted in order to identify underlying structures behind barriers and benefits to exercise.

In factor analysis the idea is to study the relationships between interrelated variables and to group these variables based on the underlying structures, or factors. The factor analysis model can be represented mathematically as

$$X_i = A_{i1}Fi + A_{i2}F_2 + A_{i3}F_3 + \ldots + A_{im}F_m + V_iU_i$$

where X_i = *i*th standardized variable

A_{ij} = standardized multiple regression coefficient of variable *i* on common factor *j*

F = common factor

V_i = standardized regression coefficient of variable *i* on unique factor *i*

U_i = the unique factor for variable *i*

m = number of common factors (Malhotra & Birks 2007, 647).

The common factors, F, can be expressed as linear combinations of the observed variables

$$F_i = W_{i1}X_1 + W_{i2}X_2 + W_{i3}X_3 + \ldots + W_{ik}X_k$$

where F_i = estimate of *i*th factor

W_{ij} = weight or factor score coefficient

k = number of variables (Malhotra & Birks 2007, 648).

A basic assumption of factor analysis is that some underlying structure exists in the set of selected variables (Hair et al. 2010, 103). As nearly all of the barrier variables are significantly correlated at the 0.01 level (2-tailed), factor analysis was determined to be an appropriate technique for analyzing the research data.

According to Malhotra and Birks (2007, 649), to achieve an appropriate sample size, there should be at least five times as many observations as there are variables. The pre-intervention data consists of 362 cases, 31 barrier variables and 29 benefit variables: The ratio for both barriers (11.7) and benefits (12.5) exceed the minimum requirement. Hence, the analysis findings are considered to have sufficient explanatory power.

The number of factors was determined based on eigenvalues, which represent the amount of variance accounted for by the factor. In this approach, only factors with eigenvalues greater than one are retained (Malhotra & Birks 2007, 654). This is to ensure that only factors with a variance greater than one are included, because it is of no use to include factors with a variance less than one as each variable per se has a variance of one.

A rotated factor matrix is produced for the purpose of easing the interpretation of the factors. The orthogonal varimax rotation method was used as it minimizes the number of variables with high loadings on a factor, and thus, enhances the interpretability of the factor solution (Malhotra & Birks 2007, 656). As the factor loadings, or coefficients, represent the correlations between the variables and factors, the variables loading high on certain factor are the ones with strongest interpretation of the underlying dimension. The factors themselves are uncorrelated. According to Hair et al. (2010), factor loadings of 0.3 to 0.4 are minimally acceptable, and values greater than 0.5 are required for practical significance. Thus, in order to ensure truly correlated variables and factors, small coefficients with value below 0.6 were suppressed.

Principal component analysis, or PCA, was used as the factor extraction method. As most of the questionnaire items were from previous, validated research, the confirmatory factor analysis that supposes certain underlying factors could have been an option. The goal of confirmatory factor analysis is to test whether the data is consistent with hypothesized

theory. As we know, exercise barrier and benefit measures are well grounded in theory. Nevertheless, PCA was chosen in order to see whether the new, added items would affect the factor solution and establish new, interesting relationships.

The sample suitability for factor analysis was tested: The data on perceived benefits had a Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy value of .947 and Bartlett´s test of sphericity value of .000 (highly significant), which both are excellent values. A KMO value greater than .5 is desirable. The data on perceived barriers had a Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy value of .924 and Bartlett´s test of sphericity value of .000, both of which are again excellent values.

3.3.2 Cluster analysis

Cluster analysis is used to classify cases into relatively homogeneous groups, or clusters, so that cases in the same cluster tend to be similar to each other based on a chosen set of variables (here perceived barrier items) – and dissimilar to cases in other clusters (Malhotra & Birks 2007, 671). In other words, cluster analysis seeks to identify a set of groups that minimize within-group variation and maximize between-group variation. Cluster analysis differs form factor analysis in that it groups cases and objects rather than variables (Hair et al. 2010, 508).

In this thesis, cluster analysis was performed in order to identify groups of respondents with similar barriers to exercise, and based on the analysis, build profiles. Hence, the analysis was run with the summarizing variables just established through factor analysis. The used measure of similarity between cases was squared Euclidean distance as it is the recommended distance measure for Ward's method (Hair et al. 2010, 521).

As the data can be considered rather small with only 362 cases, a hierarchical procedure was first chosen (Hair et al. 2010, 519). Ward's method was applied as it has the tendency to result in clusters of approximately equal size as it minimizes the within-group variation

(Hair et al. 2010, 532). The treelike visualization of the clustering, dendrogram, suggests that optimal cluster solution could be between 2 to 7 clusters (see Appendix C).

After the approximate number of clusters was determined, a non-hierarchical analysis method where number of clusters has to be determined in advance was applied. K-means clustering was performed with the number of cluster solutions ranging from 2 to 7. The number of clusters in the final solution was determined by applying measures of heterogeneity. Means of each cluster are usually studied using analysis of variance (ANOVA) to assess how distinct the clusters are from each other (Hair et al. 2010, 444). Levene's Test for Equality of Variances tests ANOVAs basic condition that variances of both samples are equal. A high value of the Levene's statistic, which is a ratio of between-groups variance to within-groups variance, results in a significant difference between clusters. However, as the basic assumption of ANOVA is thus violated (homogeneity of variance is not met), Robust Tests of Equality of Means and the Welch F statistic is used to verify whether the differences between the clusters are significant.

The above methods limited the amount of optimal cluster solutions to two: the three and four cluster solution. Appendix D includes the outputs for the aforementioned analyses. For both solutions the Levene's test was significant at least at the 0.1 level for all but 1 of the factors (see Appendix D), and hence, the variances are significantly different. The significance value of all the Welch F statistics were less than 0.05 and we can conclude that there are statistically significant differences between the clusters in both cluster solutions – that is, at least one of the means is different from the other groups' means. Games-Howell post hoc test was conducted in order to determine which means differ from each other.

Based on the post hoc test (se Appendix D), the three cluster solution could have been regarded as statistically better representation of similar subjects (differences between clusters more evident). However, the four cluster solution was chosen due to the more insightful clusters for profiling and managing people with certain barrier types. Moreover, the three cluster solution that resulted in somewhat self-evident clusters of (1) active subjects reporting low barriers to exercise in overall, (2) non-active subjects reporting comparably higher barriers to exercise and (3) subjects somewhere in between the two

extremes, who would like to exercise more, is likely to be less interesting from the perspective of commercial fitness and exercise providers.

3.4. Validity and reliability

The questionnaire's validity was confirmed by using already validated questions and by pre-testing the questionnaire. What comes to the items that were added and had not been validated in earlier research, these items were formed based on theory. Also, an "I do not know" option and a wider, 6-point scale were incorporated in order to mitigate the possible unwillingness to answer to certain questions.

Concerning reliability, the total error of a research design can be defined as the variation between the observed mean value and the true mean value of a variable, and consists of sampling and non-sampling errors. Non-sampling errors further consist of response and non-response error (Malhotra and Birks 2007, 83). The sampling error was minimized by targeting the study at all those who had at some point ended their membership in the exercise facility. However, the sampling frame was naturally limited to those who had actually provided the facility with their contact details (i.e. email address), and the permission to give it to 3rd parties. Nevertheless, the sample was considered rather representative of those who had for a reason or another quit exercising at this specific commercial exercise and fitness facility. Another source of error was the response error – i.e. respondents giving mis-recorded answers, missing questions, inability or unwillingness to respond etc. This type of error was minimized by careful translations and wordings, and by giving the respondent a comprehensive set of answer options.

What comes to the assignment of subjects to the intervention groups, an informed decision was made to thrive to randomness by *not* using totally random assignment. As age and physical activity level were shown to correlate (refer to Table 6), equal number of similar subjects on these criteria were tried to assign to each group. This way possible distortion of the results was avoided.

As reliability is also concerned with the level of consistency between different measurements of the variable, Cronbach's alpha method was used to track each factor's internal consistency reliability: Alphas value ranges between 0 and 1, values over 0.6 or 0.7 are generally deemed satisfactory (Hair et al. 2010, 125). Assessing the Cronbach's alphas in Table 11 allows us to say that all factors are internally consistent and reliable.

In cluster analysis the validity for different criterion was established by looking at how the clusters differ in variables such as subjects' age and gender, for which a theoretical ground presumes a certain variation across the clusters (Hair et al. 2010). Cross-tabulations with these variables that have been demonstrated in previous research to affect exercise behavior were used to establish the cluster interpretations, and hence, to indicate the validity of the criterion.

The overall validity and reliability of the study were considered adequate after the assessment of the different methods of data collection and analysis.

4. Findings and analysis

In this chapter the findings from factor and cluster analysis are presented. The two statistical analysis methods were used in analyzing the pre-intervention data. The post-intervention analysis concentrated on the repeated effects by comparing the pre- and post-intervention barrier measures.

4.1 Factor analysis

The factor analysis resulted in five barrier factors, which explain 62.91 % of the overall variance.

Factor	Metrics	Loading	h^2	Cronbach's alpha
Lack of skills and self-confidence, and self-consciousness	I have never learned the skills for any sport.	,746	,655	0,873
	I really can't see learning a new sport.	,796	,689	
	I'm not good enough at any physical activity to make it fun.	,735	,792	
	I'm embarrassed about how I will look when I exercise with others.	,616	,618	
Activity-related affect and low self-efficacy	Exercise tires me.	,651	,665	0,915
	I am too embarrassed to exercise.	,607	,684	
	I do not like exercising.	,847	,877	
	Exercising is of no interest to me.	,848	,824	
	I do not think I have what it takes to exercise.	,638	,720	
Lack of willpower and feeling of indolence	I've been thinking about getting more exercise, but I just can't seem to get started.	,823	,808	0,874
	It's easier for me to find excuses not to exercise than to go out to do something.	,758	,635	
	I can't make myself stick to my decision of being physically more active	,851	,846	
	I'm just too tired after my daily routines to get any exercise.	,629	,666	
Lack of resources	Places for me to exercise are too far away.	,607	,495	0,692
	Exercise facilities do not have convenient schedules for me.	,760	,658	
	There are too few places for me to exercise.	,685	,559	
Family discouragement	My spouse (or significant other) does not encourage me to exercise.	,847	,783	0,912
	My family members do not encourage me to exercise.	,869	,795	

Table 11 Barrier factor metrics and their loadings and communalities.

The inclusion of only factor loadings greater than 0.6 and adding the new barrier items resulted in a bit different factors compared to those by Sechrist, Walker & Pender (1987) and U.S. Department of Health and Human Services' (1999). First of all, the factor of physical exertion by Sechrist, Walker & Pender (2005) and factor of fear of injury by U.S Department of Health and Human Services (1999) were not included in the factor solution. On the contrary, the added items of "I do not like exercising" and "exercise is of no interest to me" (Adachi-Mejia et al. 2010), and "I do not think I have what it takes to exercise" (Pender, Murdaugh & Parsons 2005) were all included to the brand new barrier factor of activity-related affect and low self-efficacy. As was already proposed in the literature review, self-efficacy was shown to be an influential exercise barrier. Furthermore, it was shown to correlate strongly with items related to negative affect towards physical activity.

Also, the factor of lack of resources is only concerned with physical exercise facilities, not with costs or lack of time. Interestingly, the latter which has constantly been reported as a major barrier to exercise (e.g. Adachi-Mejia et al. 2010; Brinthaupt, Kang & Anshel 2010), did not correlate with any of the factors, namely lack of resources, strongly enough to be included in the analysis. However, this does not mean that lack of time would not be a relevant barrier. On the contrary, it is shown later that the factors of lack of time and social discouragement are actually somewhat interrelated in that exercise is seen taking time specifically from family relationships and responsibilities. Due to the rigid suppression of factor loadings below 0.6, however, these items that are likely to correlate both with lack of resources and family discouragement were left out of the factor solution. As was discussed earlier, the categorizations are not exclusive: Lack of time might be for one person a perceived barrier and for another an objective barrier etc.

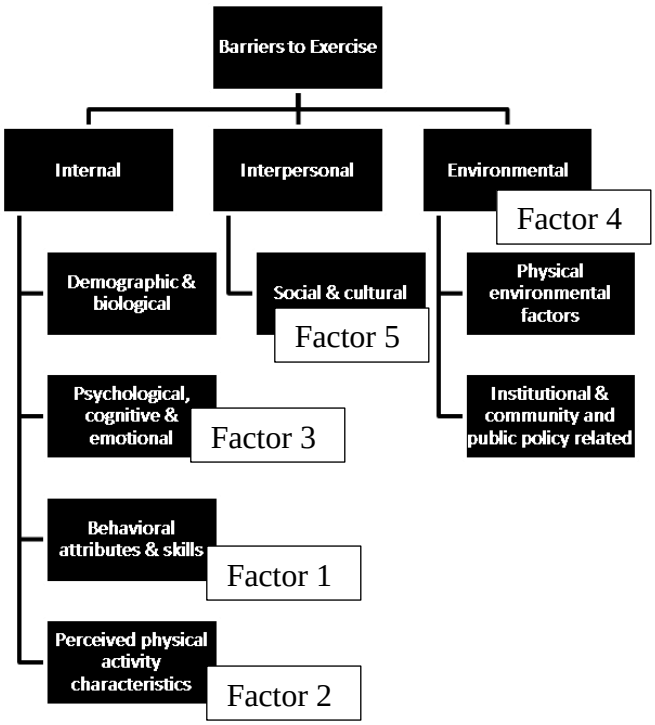

Figure 4 Barrier factors relative to the Barriers to exercise -framework

Three of the barrier factors can be classified as internal (see Figure 4), or as barriers that are in one's own control. However, this type of barriers typically requires more individualized interventions. To serve this purpose, cluster analysis was used to identifying different barrier profiles.

4.2 Cluster analysis

Cluster analysis was used to identify homogeneous groups within the subjects based on the barriers to exercise they perceive to possess. The cluster centroids that represent the mean values of the variables contained in each cluster are shown on Table 12.

	Cluster 1 (N = 174)	Cluster 2 (N = 39)	Cluster 3 (N = 36)	Cluster 4 (N = 70)
Factor 1	-,10	1,86	-,77	-,38
Factor 2	-,28	,60	1,68	-,49
Factor 3	-,37	,45	,90	,21
Factor 4	-,15	,42	-,12	,20
Factor 5	-,50	,23	-,33	1,28

Table 12 Final cluster centroids

Based on the interpretation of the cluster centroids and the Games-Howell post hoc test (see Appendix D), the following profiles were identified for the clusters:

Cluster 1 Active subjects who report low barriers to exercise in overall

It is no surprise that this is the largest cluster (N = 174), taking into account the high activity level Finnish people have been reported to sustain (Martínez-González et al. 2001 cited in Seefeldt, Malina & Clark 2002, 146). The subjects in this cluster differ from the subjects in Cluster 2 (0.60 ± 1.15) and 3 (1.68 ± 1.28) with statistically significantly lower barriers relating to activity-related affect and self-efficacy (-0.28 ± 0.468, p = .000), and from all other clusters with statistically significantly higher willpower (-.37 ± 0.78, p = .000). It is maybe due to the strong willpower that enables members of Cluster 1 to commit to being more active (cf. Revised Health Promotion Model in Figure 2). What is interesting for commercial exercise service providers, cases in this cluster perceive fewer and weaker barriers to exercise but what really separates them from the other clusters is their significantly higher willpower.

Cluster 2 "Non-exercisers" with comparably higher barriers to exercise

Cluster 2 includes subjects who are most likely to perceive the barrier of lack of skill or self-confidence as an impediment to more regular physical activity (1.86 ± 0.79, p = .000). Further, they possess barriers relating to activity-related affect, low-self-efficacy and lack

of willpower and resources. They might even perceive having the social support (lowest barrier for the cluster), but at the same time feel unskilled, have a negative affect towards exercise, low self-efficacy or blame the lack of resources for withdrawing them from exercising. In overall, they possess more and stronger barriers to exercise, but potentially the lack of skills and self-confidence are what further strengthen their perception of low self-efficacy, negative feelings attached to exercising etc.

Cluster 3 Subjects with negative affect towards exercise and who lack the willpower

Cluster 3 encompasses subjects who have lowest self-efficacy and most negative affect towards exercising (1.68 ± 1.288, $p < .003$). Members of Cluster 3 (.90 ± 1.18) are also dissociated from Cluster 1 (-.37 ± .77) and 4 (.21 ± .96) for their statistically higher perception of lack of willpower ($p < .02$). Interestingly, they seem to perceive possessing the skills and having the social support, but do not exercise because of lacking the willpower and / or having a negative attitude towards exercising. Personally I think this group is the most challenging for commercial exercise and service provider to "convert" as low self-efficacy and negative affect towards exercising are intrapersonal barriers both of which are likely to require more personal and long-term approach in order to change the underlying beliefs and attitudes. For a commercial exercise service provider this remains a very demanding group to approach.

Cluster 4 Subjects who would like to be more active but lack social support

Members of Cluster 4 are most concerned with lack of social encouragement – the factor which was statistically significantly higher and hence distinguishes them from the other clusters (1.28 ± .79, $p = .000$). However, they also have most positive affect towards exercising (-.49 ± .62, $p = .000$), which separates them from those in Clusters 2 (.60 ± 1.15) and 3 (1.68 ± 1.28). Hence, we could draw the conclusion that these subjects would *like* to be more active but are not due to the significantly higher social discouragement barriers. This cluster is very interesting from the point of view of public health and commercial

parties in that the subjects would like to exercise more, but do not perceive to receive social support or perceive that exercising is time away from social relationships. Also, at pre-test the lowest perceived benefits were items relating to social aspect of exercise ('exercising lets me have contact with friends and persons I enjoy', 'exercising is a good way for me to meet new people' and 'exercising increases my acceptance by others'), which adds to the challenge.

The Games-Howell post hoc test revealed that the clusters do not statistically significantly differ in the barrier of lack of resources. Furthermore, the barriers relating to lack of skill separate the clusters with the exception of Cluster 3 (-.77 ± .,82) and 4 (-.38 ± .77), both of which report significantly lower scores for lack of skill in comparison to Clusters 1 and 2 (p = .000). Interestingly even the active subjects from Cluster 1 report lack of skill being more of a barrier (-.10 ± .60). However, the other barriers prevent subjects in clusters 3 and 4 from being more active. As was already reflected in the revised Health Promotion Model in chapter 2.1.2 (Figure 2), the correlates of physical activity interact: For example, subjects in Cluster 3 reported lowest self-efficacy, one of the strongest predictors of health promoting behavior, which could have an impact on their perceived barriers, in this case, lack of willpower. Together these affect the subjects' willingness and perceived ability to commit to exercise.

A cross-tabulation between clusters and the level of physical activity supported the cluster interpretations (see Table 13). For the four-cluster solution the differences between the cluster means in regards to physical activity were highly significant (F (17.081), p = .000). Highest in activity (with mean of 2.65) were subjects in cluster 1, and lowest (with means of 3.92 and 3.97) were subjects from clusters 2 and 3 – members in cluster 4 remaining somewhere in between (mean activity level of 3.10). Based on the Games-Howell post-hoc test, cases in Cluster 1 (2.65 ± 1.152, p = .000) are statistically significantly more active than cases in Cluster 2 or Cluster 3. Post-hoc also showed statistically significantly higher physical activity level for Cluster 4 (3.1 ± 1.385) in comparison to Cluster 2 (3.92 ± 1.628, p = 0.046) and Cluster 3 (3.92 ± 1.521, p = 0.027). There were no statistically significant differences between the members of Cluster 2 and Cluster 3 when compared by physical activity level (p = 0.999).

Cross-tabulation was also used to check for relationships between cluster membership and gender and age (see Tables 14 and 15). Pearson's chi square test confirmed that there is an association between age and cluster membership (X^2 (9, N = 319) = 19.949, p =0.018). However, the percentages in Table 18 can be misleading, as the older age segments are far better represented in the sample. For instance, of the non-exercisers (Cluster 2), 48.7 % are in their fifties or older. At the same time, the oldest segment also seems to be the most active, 34.5 % of members in the most active group, Cluster 1, being 50+. Clusters do not statistically significantly differ by gender (X^2 (3, N = 319) = 3.195, p = 0.363).

			Cluster Number of Case				
			1	2	3	4	Total
Physical activity level	5 times a week or more often	Count	16	2	0	4	22
		% within Physical activity level	72,7%	9,1%	0,0%	18,2%	100,0%
		% within Cluster Number of Case	9,2%	5,1%	0,0%	5,7%	6,9%
		% of Total	5,0%	,6%	0,0%	1,3%	6,9%
	3-4 times a week	Count	75	3	6	23	107
		% within Physical activity level	70,1%	2,8%	5,6%	21,5%	100,0%
		% within Cluster Number of Case	43,1%	7,7%	16,7%	32,9%	33,5%
		% of Total	23,5%	,9%	1,9%	7,2%	33,5%
	1-2 times a week	Count	60	17	11	25	113
		% within Physical activity level	53,1%	15,0%	9,7%	22,1%	100,0%
		% within Cluster Number of Case	34,5%	43,6%	30,6%	35,7%	35,4%
		% of Total	18,8%	5,3%	3,4%	7,8%	35,4%
	3-4 times a month	Count	9	3	7	6	25
		% within Physical activity level	36,0%	12,0%	28,0%	24,0%	100,0%
		% within Cluster Number of Case	5,2%	7,7%	19,4%	8,6%	7,8%
		% of Total	2,8%	,9%	2,2%	1,9%	7,8%
	1-2 times a month	Count	6	4	4	4	18
		% within Physical activity level	33,3%	22,2%	22,2%	22,2%	100,0%
		% within Cluster Number of Case	3,4%	10,3%	11,1%	5,7%	5,6%
		% of Total	1,9%	1,3%	1,3%	1,3%	5,6%
	Less frequently than once a month	Count	7	8	6	8	29
		% within Physical activity level	24,1%	27,6%	20,7%	27,6%	100,0%
		% within Cluster Number of Case	4,0%	20,5%	16,7%	11,4%	9,1%
		% of Total	2,2%	2,5%	1,9%	2,5%	9,1%
	Never	Count	1	2	2	0	5
		% within Physical activity level	20,0%	40,0%	40,0%	0,0%	100,0%
		% within Cluster Number of Case	,6%	5,1%	5,6%	0,0%	1,6%
		% of Total	,3%	,6%	,6%	0,0%	1,6%
Total		Count	174	39	36	70	319
		% within Physical activity level	54,5%	12,2%	11,3%	21,9%	100,0%
		% within Cluster Number of Case	100,0%	100,0%	100,0%	100,0%	100,0%
		% of Total	54,5%	12,2%	11,3%	21,9%	100,0%

Table 13 Cross-tabulation between respondent's PA level and cluster membership.

			Cluster Number of Case				Total
			1	2	3	4	
Sex	Female	Count	136	28	26	59	249
		% within Sex	54,6%	11,2%	10,4%	23,7%	100,0%
		% within Cluster Number of Case	78,2%	71,8%	72,2%	84,3%	78,1%
		% of Total	42,6%	8,8%	8,2%	18,5%	78,1%
	Male	Count	38	11	10	11	70
		% within Sex	54,3%	15,7%	14,3%	15,7%	100,0%
		% within Cluster Number of Case	21,8%	28,2%	27,8%	15,7%	21,9%
		% of Total	11,9%	3,4%	3,1%	3,4%	21,9%
Total		Count	174	39	36	70	319
		% within Sex	54,5%	12,2%	11,3%	21,9%	100,0%
		% within Cluster Number of Case	100,0%	100,0%	100,0%	100,0%	100,0%
		% of Total	54,5%	12,2%	11,3%	21,9%	100,0%

Table 14 Cross-tabulation between respondents' gender and cluster membership.

			Cluster Number of Case				Total
			1	2	3	4	
Age	18-29	Count	27	5	3	10	45
		% within Age	60,0%	11,1%	6,7%	22,2%	100,0%
		% within Cluster Number of Case	15,5%	12,8%	8,3%	14,3%	14,1%
		% of Total	8,5%	1,6%	,9%	3,1%	14,1%
	30-39	Count	33	4	6	23	66
		% within Age	50,0%	6,1%	9,1%	34,8%	100,0%
		% within Cluster Number of Case	19,0%	10,3%	16,7%	32,9%	20,7%
		% of Total	10,3%	1,3%	1,9%	7,2%	20,7%
	40-49	Count	54	11	15	26	106
		% within Age	50,9%	10,4%	14,2%	24,5%	100,0%
		% within Cluster Number of Case	31,0%	28,2%	41,7%	37,1%	33,2%
		% of Total	16,9%	3,4%	4,7%	8,2%	33,2%
	Over 50	Count	60	19	12	11	102
		% within Age	58,8%	18,6%	11,8%	10,8%	100,0%
		% within Cluster Number of Case	34,5%	48,7%	33,3%	15,7%	32,0%
		% of Total	18,8%	6,0%	3,8%	3,4%	32,0%
Total		Count	174	39	36	70	319
		% within Age	54,5%	12,2%	11,3%	21,9%	100,0%
		% within Cluster Number of Case	100,0%	100,0%	100,0%	100,0%	100,0%
		% of Total	54,5%	12,2%	11,3%	21,9%	100,0%

Table 15 Cross-tabulation between respondents' age and cluster membership.

4.3 Post-intervention survey data analysis

Because of the very limited amount of data, the post-intervention analysis acted as a preliminary study that focuses on identifying issues for further research in the field.

For the purpose of assessing within-subject barrier level changes over time, repeated measures were used. Repeated measures ANOVA observe each subject under each experimental condition, and control for the differences between subjects (Malhotra & Birks 2007, 564). Table 16 shows the repeated barrier item measures for all subjects (N = 34) who took part in the pre-intervention questionnaire, participated in one of the three interventions and filled in the questionnaire after. Repeated measures are here reported as means in order to avoid misinterpreting individual responses (possible distortions as a result of respondent having misread the scale etc.). The pre- and post-test measures for each individual are presented in Appendix E.

Repeated measures ANOVA with Greenhouse-Geisser correction revealed that the pre- and post-intervention means differed statistically significantly for the barrier items of ‘exercise tires me’ ($F(1,33) = 7.642$, $P = 0.009$) and ‘I do not think I have what it takes to exercise’ ($F(1,33) = 4.124$, $p = 0.05$), both of which have high loadings on the factor of activity-related affect and low self-efficacy. The former was mitigated but the latter barrier referring to low self-efficacy actually increased. Barrier relating to the exercise milieu, ‘places for me to exercise are too far away’ was statistically significantly lower post-intervention ($F(1,32) = 8.970$, $p = 0.005$). Also the barrier that was not included in the factor of lack of resources, ‘it costs too much to exercise’, was mitigated ($F(1,33) = 9.222$, $p = 0.005$). Taking into consideration that among the benefit items the social items were the lowest (Table 10), it is interesting to see that the family discouragement barrier of ‘my spouse or significant other does not encourage me to exercise’ ($F(1,31) = 4.137$, $p = 0.051$), was lower post-intervention. Again, this seems to highlight the division between social support and encouragement, and time taken away from social activities.

Therefore, we can say that short-term, marketer staged interventions did elicit in this context a statistically significant mitigation in barrier items relating to activity-related affect

(‘exercise tires me’), lack of resources (‘places for me to exercise are too far away’, ‘it costs too much to exercise’) and family discouragement (‘my spouse or significant other does not encourage me to exercise’). However, the barrier relating to low self-efficacy (‘I do not think I have what it takes to exercise’) was actually statistically significantly higher post-intervention.

		Within subjects (N = 34) barrier mean				
		Pre-intervention	Post-intervention	Mean differenc e	Sig.	N
Lack of skills and self-confidence, and self-consciousness	I have never learned the skills for any sport.	2,15	2,14	-0,012	0,94	34
	I really can’t see learning a new sport.	1,85	2,09	0,244	0,365	33
	I’m not good enough at any physical activity to make it fun.	2	2,19	0,191	0,151	34
	I’m embarrassed about how I will look when I exercise with others.	2,26	2,21	-0,056	0,755	34
Activity-related affact and low self-efficacy	Exercise tires me.	2,85	2,4	-0,455	0,009**	34
	I am too embarrassed to exercise.	2,06	2,23	0,169	0,227	34
	I do not like exercising.	2,12	1,99	-0,126	0,284	34
	Exercising is of no interest to me.	1,94	1,96	0,021	0,901	34
	I do not think I have what it takes to exercise.	1,71	2,02	0,312	0,050**	34
Lack of willpower and feeling of indolence	I’ve been thinking about getting more exercise, but I just can’t seem to get sta	4,21	4,12	-0,091	0,704	34
	It’s easier for me to find excuses not to exercise than to go out to do somethi	4,06	3,93	-0,126	0,53	33
	I can’t make myself stick to my decision of being physically more active	4,09	3,75	-0,338	0,116	33
	I’m just too tired after my daily routines to get any exercise.	3,35	3,36	0,011	0,958	34
Lack of resources	Places for me to exercise are too far away.	2,94	2,43	-0,505	0,005**	33
	Exercise facilities do not have convenient schedules for me.	2,32	2,26	-0,06	0,77	31
	There are too few places for me to exercise.	2	2,05	0,055	0,753	32
Family discouragement	My spouse (or significant other) does not encourage me to exercise.	2,53	2,19	-0,339	0,051*	32
	My family members do not encourage me to exercise.	2,41	2,45	0,041	0,822	34
Items not included in the factor solution	Exercising takes too much time.	3,32	3,6	0,28	0,276	34
	It costs too much to exercise.	3,06	2,38	-0,68	0,005**	34
	I am fatigued by exercise.	2,35	2,18	-0,168	0,44	34
	Exercise takes too much time from family relationships.	2,76	2,85	0,088	0,621	34
	I do not like the way I look in exercise clothes.	2,65	2,86	0,213	0,37	34
	Exercise takes too much time from my family responsibilities.	2,76	2,85	0,088	0,621	34
	Exercise is hard work for me.	2,88	3,04	0,16	0,445	33
	Exercise can be risky so I am afraid I might get hurt.	1,76	1,86	0,094	0,518	34
	I have no one to exercise with.	3,09	2,83	-0,262	0,373	33
	My usual social activities with family or friends do not include physical activit	2,65	2,7	0,053	0,857	34
	I feel insecure.	2,41	2,42	0,007	0,972	34
	I did not exercise at younger age either.	1,97	2,09	0,123	0,67	34
	Finnish weather does not encourage me to exercise.	2,24	2,39	0,159	0,461	34

*** Mean significantly different at 0.05 level*

** Mean significantly different at 0.1 level*

Table 16 Repeated measures for pre- and post-intervention barrier means

On the other hand, when the repeated measures were run with the barriers’ sum variables, or barrier factors, there were no statistically significant changes to either direction (Table 17).

	Within subjects (N = 34) factor mean		Mean difference	Sig.
	Pre-intervention	Post-intervention		
Lack of skills and self-confidence, and self-consciousness	2,100	2,182	0,082	0,509
Activity-related affect and low self-efficacy	2,135	2,124	-0,012	0,902
Lack of willpower and feeling of indolence	3,944	3,818	-0,126	0,371
Lack of resources	2,441	2,318	-0,124	0,291
Family discouragement	2,426	2,309	-0,118	0,407

Table 17 Repeated measures by factor

Appendix F represents the repeated measures also by intervention group. Each group is briefly gone through separately. The repeated effects' pre- and post-intervention survey data for barrier items was also manually skimmed to avoid distortion due to the use of arithmetic means, and to see whether any patterns emerged for subjects within the same intervention group.

Group 1 Physical fitness test

Barriers that were mitigated (significant change at least at the 0.1 level) in physical fitness test intervention group included 'exercise tires me' ($p = 0.048$), 'my spouse or significant other does not encourage me to exercise' ($p = 0.078$), and 'my family members do not encourage me to exercise'.

The item of 'Exercise tires me" is the only variable in Factor 2, negative activity-related affect and low self-efficacy, that was mitigated significantly. This could be because the fitness test gave insight to the participants of their own physical level relative to others, and hence, could have given the impression of exercising not being just "dull". However, the other barriers of having a negative attitude towards exercising, lacking the interest and possessing low-self-efficacy were not significantly reduced. These are, in my opinion, more

deeply rooted barriers that would require more time to change. For example, after the fitness test a person might consider his or her results and realize the inconsistency in the values and behavior, as Anshel and Kang (2007) suggested – changing attitudes and behavior are longer processes. Perceiving exercise as tiresome or dull, on the other hand could possibly be changed by one positive experience.

Two of the latter variables that were mitigated form Factor 5, social encouragement. The fitness test showed to the participants that they do get support from their close ones. However, as will be discussed next, the intervention confirmed and strengthened the barriers relating to exercising taking too much time from family and it not being included in social activities. Hence, the social dimension seems to be two-fold: While the subject might feel supported, the time taken to exercise is perceived as being time away from family and friends.

The strengthened barriers (significant change from pre to post-intervention at least at the 0.1 level) were 'exercise takes too much time from my family responsibilities' ($p = 0.041$), 'my usual social activities with family or friends do not include physical activity' ($p = 0.033$), and 'I am embarrassed about how I will look when I exercise with others' ($p = 0.033$). The latter barrier relating to Factor 1 is a variable more concerned with lack of self-confidence while the rest relate to lack of skills. The fact that a physical fitness test actually strengthened the perception of exercising among others being embarrassing, is not too surprising as the fitness test was performed in a group with a pair taking up the results. This definitely can make the participant more aware of themselves and how they look.

The repeated measures run with the factor solution also confirms that the barriers relating to activity-related affect and family discouragement were statistically significantly mitigated whereas the barriers regarding self-confidence and self-consciousness were higher (Table 18). This implies that the cognitive intervention design ought to be targeted at persons who can be identified as members of Cluster 4, subjects who perceive to lack the social support; perhaps also Cluster 2, the members of which have a negative affect towards exercise.

	Within subjects (N = 8) factor mean		Mean difference	Sig.
	Pre-intervention	Post-intervention		
Lack of skills and self-confidence, and self-consciousness	1,175	1,338	0,163	0,014**
Activity-related affect and low self-efficacy	1,425	1,275	-0,150	0,08*
Lack of willpower and feeling of indolence	3,775	3,838	0,063	0,860
Lack of resources	2,250	1,838	-0,413	0,263
Family discouragement	2,188	1,813	-0,375	0,08*

** Mean significantly different at 0.05 level

* Mean significantly different at 0.1 level

Table 18 Repeated measures by factor for cognitive intervention

Group 2 Method Mentra

The barriers that were mitigated at the significance level of 0.05 included ‘places for me to exercise are too far away’ ($p = 0.015$), ‘it costs too much to exercise’ ($p = 0.006$) and ‘exercise takes too much time from family relationships’ ($p = 0.032$). At 0.1 significance level also the item of ‘my spouse (or significant other) does not encourage me to exercise’ was mitigated ($p = 0.078$).

Hence, it seems like the group discussion was successful in weakening negative perceptions towards the social aspects of exercise and its requirement for resources. This is actually great news for an exercise service provider, as these interpersonal and environmental barriers are the toughest to intervene. None of the barriers were statistically significantly strengthened during the intervention. However, it would be pivotal to see whether barriers would be perceived the same way when actually including some physical activity. Further, the barriers of ‘it costs too much’ and ‘exercise takes too much time from family relationships’ were not included in the factor analysis, so when running the repeated measures analysis for this intervention group by factor, no statistically significant differences were reported in any of the 5 barrier factors (Table 19) even though all factors

were slightly lower post-intervention. I would suggest the affective intervention to be most effective when targeted at those in Cluster 2 with overall high barriers.

	Within subjects (N = 16) factor mean			
	Pre-intervention	Post-intervention	Mean difference	Sig.
Lack of skills and self-confidence, and self-consciousness	2,388	2,288	-0,100	0,532
Activity-related affect and low self-efficacy	2,400	2,375	-0,025	0,875
Lack of willpower and feeling of indolence	4,175	3,963	-0,213	0,383
Lack of resources	2,713	2,538	-0,175	0,153
Family discouragement	2,500	2,313	-0,188	0,371

Table 19 Repeated measures by factor for affective intervention

Group 3 Fustra demo class

Subjects in intervention group 3, or the behavioral intervention, had none of their exercise barriers reduced statistically significantly. On the other hand, various barriers were actually strengthened: At the significance level 0.1, barriers of ‘exercising takes too much time’ ($p = 0.052$), ‘exercise facilities do not have convenient schedules for me’ ($p = 0.081$), ‘there are too few places for me to exercise’ ($p = 0.081$) and ‘I did not exercise at younger age either’ ($p = 0.054$) were reinforced.

The two barriers related to Factor 4, lack of resources, were higher post- than pre-test. The reason for this could be that this intervention was held on a Friday night, which is potentially a challenging time for many to fit in their schedule. Also, subjects could think that they do not have the place with right equipment available to do such exercise as Fustra.

Interestingly, only the raise in the barrier of ‘Finnish weather does not encourage me to exercise’ was highly significant at the 0.05 level ($p = 0.037$). There’s not actually much that could explain why this specific barrier significantly rose from pre-test.

Compared to the other two intervention groups, the subjects taking part to the demo class had higher post-test barriers for items relating to lack of resources, or environmental factors that are outside of one's own and most exercise service providers' realm. Previous physical activity could also be seen as an external barrier from the perspective that no one can change the exercise behavior or experiences one has had in the past. Further, the raised barriers tend to be very "practical and rational", whereas for the two first intervention groups more emotional reasoning seemed to take place, indicated by more social and personal factors being changed in the intervention.

Again, when looking from the factor perspective, there were no significant changes in the different barrier factors (Table 20): All the factors were, nonetheless, somewhat higher post-test with the exception of lack of willpower and feeling of indolence that was slightly mitigated.

	Within subjects (N = 10) factor mean			
	Pre-intervention	Post-intervention	Mean difference	Sig.
Lack of skills and self-confidence, and self-consciousness	2,380	2,690	0,310	0,375
Activity-related affect and low self-efficacy	2,280	2,400	0,120	0,564
Lack of willpower and feeling of indolence	3,710	3,570	-0,140	0,298
Lack of resources	2,160	2,350	0,190	0,358
Family discouragement	2,500	2,700	0,200	0,534

Table 20 Repeated measures by factor for behavioral intervention

5. Summary and conclusion

Pre-intervention survey data was disposed to factor and cluster analysis in order to see whether the different barrier types (factor analysis) could potentially be used to group people (clustering). Based on these groups of subjects with similar barriers, it was then reasoned whether these groupings could be used as a basis to better target the specific barrier types with marketing interventions. Finally, the effect of these interventions was addressed.

Below the results are discussed in brief, and the study's contribution to planning short-term marketing interventions aimed at mitigating exercise barriers and issues for future research are presented.

5.1 Discussion

This study contributes to the field by being among the first ones to focus on consumers' perceived barriers to exercise, how these barriers could be used to segment consumers', and how could the barriers be mitigated with short-term, marketer-staged interventions. The findings of the study highlight the opportunities barrier-based segmentation offers for commercial exercise service providers and show preliminary support for marketing interventions' effectiveness.

Theoretical part of the study shed light on different types of barriers to exercise, and how they affect consumers' exercise behaviors. Frameworks were built to portray the underlying structures in exercise behavior and barrier types to be considered when aiming at mitigating the barriers to increase physical activity. Next, different interventional approaches to mitigating exercise barriers were identified in order to provide the basis for the empirical design. The empirical part employed a pre-test-post-test design where first the participants' perceived barriers to exercise were identified by conducting a survey. Identified non-exercisers were then predisposed to different marketer-staged interventions, after which a

pre-test survey was conducted. The interventions and the post-intervention survey were used to find underlying patterns of whether certain interventions mitigated certain barriers most efficiently.

The factor analysis resulted in five barrier factors that are supported by previous exercise barrier research (Sechrist et al. 1987; U.S. Department of Health & Human Services, 1999) but also contributed to the research by showing how the added barrier items relate to and correlate with the existing items. Of the five barrier factors, one factor could be classified as interpersonal (Factor 5), one as environmental (Factor 4), and three as internal (Factors 1, 2 and 3) (see Figure 4). Even though people with external barriers (including interpersonal and environmental barriers) are more likely to change exercise behavior than people with internal barriers (Ziebland et al. 1998), external barriers typically require a public policy approach. Internal barriers, on the other hand, have been claimed to require more personalized intervention methods, and for this reason, cluster analysis was run in order to find underlying barrier and barrier profiles, and to see if these clusters could serve as a basis to better target interventions aiming at mitigating exercise barriers.

The results of the clustering suggest that the subjects could be grouped into four clusters, each with unique perceptions on exercise barriers and with different physical activity profiles. These clusters could be used in new customer encounters, where with relatively few questions a commercial exercise service provider's customer representative could find out which profile the consumer is most likely to match with – and personalize the customer relationship accordingly.

In order to see whether commercial exercise and fitness service providers' different interventions built on marketing appeals could mitigate barriers, repeated measures for pre- and post-intervention barrier levels were used. Due to the small sample at post-test, no representative conclusions can be done on whether certain intervention types had a greater effect on certain barrier types, or whether cluster members with different exercise profiles are more prone or adaptive to certain marketing interventions. Even though there were no statistically significant changes in the barrier factors themselves, the study does offer insight for future research by showing support for short-term, marketer-staged interventions

eliciting a statistically significant mitigation in barrier items relating to activity-related affect (‘exercise tires me’), lack of resources (‘places for me to exercise are too far away’, ‘it costs too much to exercise’) and family discouragement (‘my spouse or significant other does not encourage me to exercise’). Rather unexpectedly, the barrier relating to low self-efficacy (‘I do not think I have what it takes to exercise’) was actually statistically significantly higher post-intervention.

When looking at the interventions separately, all intervention groups reported very different results regarding the changes in barrier levels. The informational or cognitive intervention mitigated barriers relating to the factor of negative exercise-related affect and family discouragement. Also the factor of lack of self-confidence and self-consciousness was statistically significantly changed but to the worse. Surprisingly, the intervention strengthened the social barriers more concerned with the time taken away from social activities whereas the barriers referring to the actual social side of exercise were mitigated. This clearly shows the two-fold nature of the social aspect of exercise. Also, lack of time has had probably the most importance assigned to, and as seen, from a commercial fitness and exercise service provider’s point of view this is also probably the most challenging barrier to overcome (e.g. Adachi-Mejia et al. 2010; Brinthaupt, Kang & Anshel 2010; Sallis & Owen 1999).

Even though no barrier factors were statistically significantly mitigated, the affective intervention (Method Mentra) was the most effective in mitigating perceived exercise barriers: Items in the factor of lack of resources (‘Places for me to exercise are too far away’) and family discouragement (‘My spouse (or significant other) does not encourage me to exercise’) were statistically significantly lower pre-intervention, as were the two items very closely linked to these factors – ‘It costs too much to exercise’ and ‘exercise takes too much time from family relationships’. Taking into account the two-fold nature of the social aspect, it was a surprising result that both were mitigated in the affective intervention.

Unlike the affective intervention, the behavioral intervention Fustra demo class that involved actual physical activity strengthened the barrier items relating to the factor of lack of resources and time. It is unsurprising that the barrier relating to previous physical

activity was higher post-intervention. Fustra is a method where previous exercise habits can be observed with ease, and hence, can easily make consumer "defensive". Finally, the environmental barrier of 'Finnish weather does not encourage me to exercise' was rather surprisingly strengthened. This could, however, link to some extent with the previous physical activity, in that it would explain to the consumer why he or she has not been motivated to being physically more active.

When looking at the results at the level of barrier items, the findings provide support for affective marketing appeals being more effective than cognitive appeals (Conner et al. 2011). However, the repeated measures with the factor solution showed that the cognitive intervention was actually the only treatment to have any significant changes in the barrier factors. Nevertheless, behavioral intervention was rather surprisingly least effective in mitigating barriers to exercise, and rather strengthened the perceptions of barrier items.

Unfortunately the internal barriers I feel are the most imperative because of their strong effect on physical activity, those of low self-efficacy and lack of willpower, were not changed to either direction. In my opinion this implies that a more personal approach is required from marketing interventions. This, of course, is not exactly much of use for public health, but could potentially be of more interest to commercial exercise service providers. As was already learned earlier, perceived barriers must be overcome regardless of the existence of objective barriers. This only highlights the importance of mitigating for instance the effect of low self-efficacy.

It is also pivotal to keep in mind the categorization between invariable and modifiable exercise barriers, which provides an important frame for barriers that cannot vs. can and should be targeted when trying to reduce physical inactivity. Nevertheless, it was interesting to note that even those factors that are considerable exercise barriers and that a commercial exercise service provider could be unable or unwilling to change (e.g. price of services), were actually affected in the interventions (e.g. the item of "exercising is too expensive" was mitigated).

5.3 Conclusions

The objective of the thesis was to answer to the research question of *how can a commercial fitness and exercise service provider mitigate consumers' perceived barriers to exercise with marketing interventions*, and the following conclusions could be drawn from the study:

How perceived exercise barriers affect consumers' exercise behavior?

Barriers to exercise are any factors preventing individuals from engaging in exercise. In order to understand the dimensions underlying exercise behaviors, the framework in Figure 2 illustrates how barriers together with other factors contribute to consumers' willingness and perceived ability to exercise, and thereby decrease commitment to the wanted behavior. The different barrier types that have been well acknowledged in previous physical activity research and their relationships are represented in the Barriers to exercise -framework (Figure 3).

What types of consumer segments can be distinguished based on different barrier types in order to better manage, comprehend and target the specific barrier types?

Previous research in exercise has never seemed to recognize the usefulness of segmentation based on consumers' perceived barriers. After having gathered together a comprehensive variety of well-established barrier items, five underlying dimensions could be identified:

- Lack of skills and self-confidence, and self-consciousness
- Negative activity-related affect and low self-efficacy
- Lack of willpower and feeling of indolence
- Lack of resources
- Family discouragement

Based on these five dimensions of barriers identified, four distinct consumer segments were distinguished and labeled as

- Active subjects who report low barriers to exercise in overall
- Non-exercisers with comparably higher barriers to exercise
- Subjects with negative affect towards exercise and who lack the willpower
- Subjects who would like to be more active but lack social support

The findings of the cluster analysis show support to barrier-based segmentation being a useful tool for commercial exercise service providers. The clusters help understand different consumer needs and distinguish between effective ways of targeting them and their barriers to exercise.

How marketing practices can be used in interventions aimed at mitigating exercise barriers?

Intervention studies in physical activity have previously used costly and lengthy means, which would not be feasible for a commercial exercise service provider. Therefore, marketing interventions consisting of single, group-based sessions were designed based on the three appeals often used in marketing communications and attitude change theories: Cognitive, affective and behavioral.

What marketing appeals are most effective regarding different barriers?

Cognitive marketing appeals showed support for statistically significantly mitigating the barrier factors of negative exercise-related affect and family discouragement, and thereby creating more positive beliefs about exercise. The two other intervention types did not result in significant changes in the factors. On the other hand, affective marketing appeals efficiently mitigated barrier items relating to lack of resources and interpersonal variables. The behavioral intervention, on the other hand, seemed to make the subjects somewhat "defensive" by introducing a new training method: Barriers relating to lack of resources and time, and previous physical activity were stronger after the intervention.

5.2 Managerial Implications

The present study had two main expected contributions: First, it was examined whether short-term interventions, available for commercial exercise and fitness service providers, can be used effectively to mitigate consumers' barriers to exercise. The implications of this were twofold;

(1) From a managerial perspective, the findings of the study help gym owners to target new customer segments and thus create new opportunities to expand their business.

(2) From the perspective of public health and well-being, the findings of the study provide tools for engaging the commercial exercise and fitness service providers in promoting physical activity as a source of common well-being.

This study revealed interesting insight for commercial fitness service providers and how they could with short-term marketing interventions mitigate consumers' barriers to exercise and hence, make them more active. The cluster analysis provided them with profiles, based on which they can better stress the key barriers most paramount for that specific customer segment.

Second, I aimed at identifying the most efficient means for affecting different types of exercise barriers. Marketers of exercise services have various means available to target persons who have quit or reduced exercising, who have visited the facility but have not signed up for a membership etc. For instance, short-term marketing interventions could include free group exercise class trials, motivational group discussions, sessions with personal trainer etc.

By looking at the repeated measure analysis, the most effective marketing approaches to mitigating consumers' barriers to exercise were the cognitive and affective intervention. Nevertheless, the fact that the cognitive intervention was the only one to mitigate a barrier item linked to activity-related affect and low self-efficacy, is a result worth of highlighting.

After all, changing attitudes towards more positive in a short-term intervention gives promising insight for future research.

Based on the identified consumer segments and findings from the experiment, a customer identified within Cluster 4, someone who would like to be more active but lacks social support, could be approached with physical fitness test -like cognitive intervention or Method Mentra -like motivational marketing that were effective in reducing perceptions of lack of social encouragement. On the other hand, a customer fitting to the profile of Cluster 2, non-exerciser with comparably higher barriers to exercise, could be targeted with the affective intervention design that mitigated all types of barriers but most likely do require a more personalized approach in order to take into account the most imperative barriers underlying the impediments to exercise.

Interestingly none of the barrier items were statistically significantly mitigated in the behavioral intervention design, or the Fustra demo class. However, this is not to say that behavioral interventions as such should be omitted from future research's interest – the results could be very different if the demo class was changed to a normal personal trainer session or if the group context was removed. Had the transformational intervention been more behavior specific, the subjects could have responded differently. From this study's results we could infer that involvement to a new physical activity in a group context makes the intervention intimidating enough to actually make the subjects more susceptible to "excuses" (e.g. exercising takes too much time, weather is horrible, gym opening times do not fit my schedule, I did not exercise at younger age either etc.). One could argue that the fitness test was also about physical activity in the context of a group. Nevertheless, for the test situation that provided the subjects with information on their physical performance, it seemed to be more paramount for the subjects how they look in the eyes of others and noticing that they do not normally exercise with family and friends. In other words, for the fitness test group the barriers seemed to be more "real", and thought through in the sense that the subjects seemed to rationalize to themselves why they did at the fitness test as well or as poorly as they did.

As was demonstrated with the subjects taking part to the physical fitness test, the social dimension of exercise barriers seems to be two-fold: Subjects' post-intervention ratings for

the barrier of lack of support from family were significantly lower, whilst the barriers of exercising taking too much time from family and usual social activities not including exercising were rated higher. Therefore, managing the social or interpersonal dimension of exercise barriers remains a challenge for exercise service providers and especially for public health promotion.

5.3 Limitations and implications for future research

There were multiple issues in the study that were acknowledged but could not be addressed within the limits of the present study. Pertinent research questions, such as *why* certain intervention types have greater impact on certain barriers and *how effective* are these brief interventions in the long term, remain open.

First of all, the interventions only included group interventions, which may well have emphasized the social aspect and for instance the feeling of low self-efficacy and self-consciousness. Secondly, the sample was too small to include a control group to compare the experimental or treatment group with.

As for implications for future research, there are a few key areas that should be further researched based on the present study's preliminary tests and interpretations. One area of special interest would be clustering the perceived benefits and assessing whether certain benefit and barrier types go hand in hand. Further, it would also be interesting to see whether the subjects' cluster membership would have any detectable mediating effect on different barrier types' change in interventions – by showing that certain intervention either mitigates or strengthens a barrier factor throughout the cases in a cluster. This analysis, however, requires a significantly larger data.

One question that has been dealt with in a number of studies is how the intervention affected physical activity in the long-term. Did mitigating the barriers actually lead to higher willingness to exercise and stronger perception of ability to exercise, strengthen commitment and thus result in higher activity levels?

In regard to the representativeness of the data, the findings of the present study are limited to this specific context only: Generalizations or projections to other contexts must be done with care. Even though the reviewed literature and theories can be considered to some extent universal, the empirical study findings are limited to the local context as the barrier measures are likely to be very different in different geographical or demographical contexts. What comes to the chosen quantitative method, qualitative approach could assist in confirming the findings and the underlying barrier dimensions.

Finally, the consideration of the phase of behavior change, in other words how willing the person is to increase physical activity (refer to Transtheoretical Model), has been left for very little attention. I, however, see it as an effective and rather simple tool to segment consumers and to approach barriers to exercise.

6. References

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Appendix A-1 Pre-intervention survey

Suomalaisten liikuntatottumukset

Tervetuloa vastaamaan suomalaisten liikuntatottumuksia kartoittavaan kyselyyn! Kysely toteutetaan osana Tekesin rahoittamaa Virtual Coach - Hyvinvoinnin polut -tutkimusprojektia.

Kysely koostuu monivalintakysymyksistä ja vie vain 5-10 minuuttia. Kyselyn tulokset raportoidaan nimettöminä ja ainoastaan kokonaisuuksina siten, ettei yksittäisiä vastaajia voida tunnistaa.

Mikäli Sinulla on kysyttävää kyselyyn liittyen, otathan yhteyttä: puh. 040 773 9570 / Elina Enqvist tai s-postitse elina.enqvist@aalto.fi.

Kiitos panoksestasi suomalaisen kansanterveyden kannalta tärkeän asian tutkimiseen!

Taustatiedot

1. Sukupuolesi *

- (●) Nainen
- ( ) Mies

2. Ikäsi *

- (●) Alle 18
- ( ) 18-29
- ( ) 30-39
- ( ) 40-49
- ( ) Yli 50

Nykyinen aktiivisuutesi

3. Kuinka usein harrastat hyötyliikuntaa (lumityöt, haravointi, työmatkan kulkeminen kävellen tai pyörällä auton sijaan yms. liikkuminen, jonka vähimmäiskesto on 30 minuuttia)? *

- (●) 5+ kertaa viikossa
- ( ) 3-4 kertaa viikossa
- ( ) 1-2 kertaa viikossa
- ( ) 3-4 kertaa kuukaudessa
- ( ) 1-2 kertaa kuukaudessa
- ( ) Harvemmin kuin kerran kuukaudessa
- ( ) En koskaan

4. Kuinka usein harrastat kuntoliikuntaa (vähintään 30 minuuttia yhtäjaksoista, sykettä kohottavaa liikkumista)? *

- (●) 5+ kertaa viikossa
- ( ) 3-4 kertaa viikossa
- ( ) 1-2 kertaa viikossa
- ( ) 3-4 kertaa kuukaudessa
- ( ) 1-2 kertaa kuukaudessa
- ( ) Harvemmin kuin kerran kuukaudessa
- ( ) En koskaan

Seuraava -->

Liikuntaa edistävät tekijät

5. Alla on väittämiä liikuntaan liittyen. Osoita asteikolla yhdestä kuuteen missä määrin olet samaa tai eri mieltä väittämien kanssa. *

1 = täysin eri mieltä, 2 = eri mieltä, 3 = jokseenkin eri mieltä, 4 = jokseenkin samaa mieltä, 5 = samaa mieltä, 6 = täysin samaa mieltä ja EOS = En osaa sanoa

	1	2	3	4	5	6	EOS
1. Nautin liikunnasta. *	◉	○	○	○	○	○	○
2. Liikunta vähentää kokemaani stressiä ja kireyttä. *	◉	○	○	○	○	○	○
3. Liikunta kohentaa henkistä terveyttäni. *	◉	○	○	○	○	○	○
4. Parannan sydämeni kuntoa harrastamalla liikuntaa. *	◉	○	○	○	○	○	○
5. Liikunta parantaa lihasvoimaani. *	◉	○	○	○	○	○	○
6. Liikunnan kautta tunnen saavuttavani henkilökohtaisesti jotakin. *	◉	○	○	○	○	○	○
7. Liikunta saa minut tuntemaan itseni rentoutuneeksi. *	◉	○	○	○	○	○	○
8. Liikunta antaa minulle mahdollisuuden olla yhdessä ystävien ja ihmisten, joiden seurasta nautin, kanssa. *	◉	○	○	○	○	○	○
9. Liikunta auttaa minua ehkäisemään korkeaa verenpainetta. *	◉	○	○	○	○	○	○
10. Liikunta kohottaa fyysistä kuntotasoani. *	◉	○	○	○	○	○	○
11. Liikunta kehittää lihasteni jäntevyyttä. *	◉	○	○	○	○	○	○
12. Liikunta parantaa sydän- ja verisuonielimistöni toimintaa. *	◉	○	○	○	○	○	○
13. Tunnen, että hyvinvointini kohenee liikunnasta. *	◉	○	○	○	○	○	○
14. Liikunta kehittää sisuani. *	◉	○	○	○	○	○	○
15. Liikunta lisää liikkuvuuttani. *	◉	○	○	○	○	○	○
16. Liikunta kehittää luonteenlujuuttani. *	◉	○	○	○	○	○	○
17. Liikunta auttaa minua nukkumaan paremmin öisin. *	◉	○	○	○	○	○	○
18. Elän pidempään jos harrastan liikuntaa. *	◉	○	○	○	○	○	○
19. Liikunta auttaa minua vähentämään väsymystä. *	◉	○	○	○	○	○	○
20. Liikunta on minulle hyvä keino tavata uusia ihmisiä. *	◉	○	○	○	○	○	○
21. Liikunta kehittää fyysistä kestävyyttäni. *	◉	○	○	○	○	○	○
22. Liikunta parantaa minäkäsitystäni. *	◉	○	○	○	○	○	○
23. Liikunta nostaa henkistä vireystasoani. *	◉	○	○	○	○	○	○
24. Liikunta parantaa kykyäni suoriutua jokapäiväisistä toimistani ilman, että väsyn. *	◉	○	○	○	○	○	○
25. Liikunta edistää työni laatua. *	◉	○	○	○	○	○	○
26. Liikunta on minulle hyvää ajanvietettä. *	◉	○	○	○	○	○	○
27. Liikunta tekee minusta hyväksytymmän muiden keskuudessa. *	◉	○	○	○	○	○	○
28. Liikunta kehittää kehoni toimintaa yleisesti. *	◉	○	○	○	○	○	○
29. Liikunta kohentaa kehoni ulkonäköä. *	◉	○	○	○	○	○	○

<-- Edellinen Seuraava -->

Liikuntaa vähentävät tekijät

6. Alla on väittämiä liikuntaan liittyen. Osoita asteikolla yhdestä kuuteen missä määrin olet samaa tai eri mieltä väittämien kanssa. *

1 = täysin eri mieltä, 2 = eri mieltä, 3 = jokseenkin eri mieltä, 4 = jokseenkin samaa mieltä, 5 = samaa mieltä, 6 = täysin samaa mieltä ja EOS = En osaa sanoa

	1	2	3	4	5	6	EOS
1. Liikunta vie liikaa aikaa. *							
2. Liikunta on mielestäni tylsää. *							
3. Liikuntaan soveltuvat tilat ovat liian kaukana. *							
4. Koen liikkumisen kiusallisena. *							
5. Liikunnan harrastaminen on liian kallista. *							
6. Liikuntatilojen aukioloajat eivät sovi minulle. *							
7. Liikunta on fyysisesti liian rasittavaa. *							
8. Puolisoni / läheiseni eivät kannusta minua liikkumaan. *							
9. Liikuntaan käytetty aika on pois perheen parissa vietetystä ajasta. *							
10. En pidä siitä miltä näytän urheiluvaatteissa. *							
11. Perheeni ei kannusta minua liikkumaan. *							
12. Liikunnan harrastaminen vie liikaa aikaa kotitöiltä. *							
13. Liikunta vaatii liikaa vaivaa. *							
14. Liikuntaan soveltuvia paikkoja on liian vähän. *							
15. Olen ajatellut harrastavani enemmän liikuntaa, mutta en saa itseäni aloittamaan. *							
16. Tekosyiden keksiminen liikkumattomuudelle on helpompaa kuin liikunnan harrastaminen. *							
17. En pysty pitäytymään päätöksessäni liikkua aktiivisemmin. *							
18. Liikunta on riskialtista, joten pelkään voivani satuttaa itseni. *							
19. En ole koskaan oppinut taitoja mihinkään lajiin. *							
20. Koen, että minusta ei ole oppimaan uusia liikuntalajeja. *							
21. En ole riittävän taitava missään lajissa nauttiakseni liikunnasta. *							
22. Minulla ei ole ketään kenen kanssa harrastaa liikuntaa. *							
23. Koen sen miltä näytän liikuntaa muiden kanssa harrastaessani kiusalliseksi. *							
24. Perheeni ja läheiseni eivät harrasta liikuntaa. *							
25. Olen arkirutiinieni jälkeen liian väsynyt harrastaakseni liikuntaa. *							
26. Tunnen oloni epävarmaksi. *							
27. En pidä liikunnasta. *							
28. Liikunta ei kiinnosta minua. *							
29. En usko, että minusta on liikunnan harrastamiseen. *							
30. En harrastanut liikuntaa nuorempanakaan. *							
31. Suomen ilmasto ei kannusta minua liikkumaan. *							

<-- Edellinen | Seuraava -->

Suomalaisten liikuntatottumukset

7. Kuntokeskus Verde palkitsee jokaisen tähän kyselyyn vastanneen ja yhteystietonsa jättäneen tarjoamalla veloituksetta kuukausikortin Verdeen. Lisäksi kaikkien yhteystietonsa jättäneiden kesken arvotaan Hotelli Haikon Kartanon lahjoittama majoituslahjakortti (kylpylähotellipaketti kahdelle). Osalle kyselyn vastaajista tarjoutuu myös mahdollisuus osallistua yhdessä Kuntokeskus Verden kanssa toteutettavaan jatkotutkimukseen. Jatkotutkimusta, kuukausikorttia ja arvontaa varten pyydämme Sinua vielä seuraavassa antamaan yhteystietosi (nimi, sähköposti ja puhelinnumero).

Yhteystietoja käytetään ainoastaan edellä mainittuihin tarkoituksiin. Kyselyn tulokset raportoidaan nimettöminä ja ainoastaan kokonaisuuksina siten, ettei yksittäisiä vastaajia voida tunnistaa. Kuukausikortti Verdeen on noudettavissa Verden vastaanotosta (Työpajatie 21, 06150 Porvoo - www.verde.fi) 30.04.2012 mennessä. Olemme Sinuun mahdollisesti yhteydessä jatkotutkimukseen liittyen. Arvonnan tuloksista ilmoitamme voittajalle henkilökohtaisesti.

Nimi

Sähköposti

Puhelinnumero

<-- Edellinen Lähetä

100% valmiina

Appendix A-2 English translation of pre-intervention survey

Finn's Exercise habits

Welcome to complete the survey mapping the Finn's exercise habits! The survey is carried out as a part of a research project 'Virtual coach – Hyvinvoinnin polut' funded by Tekes.

The survey consists of multi-choice questions and only takes 5-10 minutes. The results of this survey are reported anonymously and only as entities so that no individual respondent can be identified.

In case you have questions regarding the survey, please contact me on: 040 77 39 570 / elina.enqvist@aalto.fi.

Thank you for your contribution to this research important to Finland's public health!

Background information

1. Sex: Female / Male

2. Age: Under 18 / 18-29 / 30-39 / 40-49 / 50 or over

Current activity level

3. How often do you cycle or walk to work or are otherwise active in daily routines?

4. How often do you exercise (at least 30 minutes of continuous, cardiovascular physical activity)?

Factors promoting physical activity

5. Below are statements concerning exercise. On scale from one to six, to what extent do you agree or disagree?

1 = Totally disagree, 2 = Disagree, 3 = Somewhat disagree, 4 = somewhat agree, 5 = agree, 6 = Totally agree, and 7 = Do not know.

1 I enjoy exercise.

2 Exercise decreases feelings of stress and tensions for me.

3 Exercise improves my mental health.

4 I will strengthen my heart by exercising.

5 Exercise improves my muscle strength.

6 Exercise gives me a sense of personal accomplishment.

7 Exercising makes me feel relaxed.

8 Exercising lets me have contact with friends and persons I enjoy.

9 Exercising will keep me from having high blood pressure.

10 Exercising increases my level of physical fitness.

11 My muscle tone is improved with exercise.

12 Exercising improves functioning of my cardiovascular system.

13 I have improved feelings of wellbeing from exercise.

14 Exercise increases my stamina.

15 Exercise improves my flexibility.

16 My disposition is improved with exercise.

17 Exercising helps me sleep better at night.

18 I will live longer if I exercise.

19 Exercise helps me decrease fatigue.

20 Exercising is a good way for me to meet new people.

21 My physical endurance is improved by exercising.

22 Exercising improves my self-concept.

23 Exercising increases my mental alertness.

24 Exercise allows me to carry out normal activities without becoming tired.

25 Exercising improves the quality of my work.

26 Exercise is good entertainment for me.

27 Exercising increases my acceptance by others.

28 Exercise improves overall body functioning for me.

29 Exercise improves the way my body looks.

Factors decreasing physical activity

6. Below are statements concerning exercise. On scale from one to six, to what extent do you agree or disagree?

1 = Totally disagree, 2 = Disagree, 3 = Somewhat disagree, 4 = somewhat agree, 5 = agree, 6 = Totally agree, and 7 = Do not know.

1 Exercising takes too much time.

2 Exercise tires me.

3 Places for me to exercise are too far away.

4 I am too embarrassed to exercise.

5 It costs too much to exercise.

6 Exercise facilities do not have convenient schedules for me.

7 I am fatigued by exercise.

8 My spouse (or significant other) does not encourage me to exercise.

9 Exercise takes too much time from family relationships.

10 I do not like the way I look in exercise clothes.

11 My family members do not encourage me to exercise.

12 Exercise takes too much time from my family responsibilities.

13 Exercise is hard work for me.

14 There are too few places for me to exercise.

15 I've been thinking about getting more exercise, but I just can't seem to get started.

16 It's easier for me to find excuses not to exercise than to go out to do something.

17 I can't make myself stick to my decision of being physically more active.

18 Exercise can be risky so I am afraid I might get hurt.

19 I have never learned the skills for any sport.

20 I really can't see learning a new sport.

21 I'm not good enough at any physical activity to make it fun.

22 I have no one to exercise with.

23 I'm embarrassed about how I will look when I exercise with others.

24 My usual social activities with family or friends do not include physical activity.

25 I'm just too tired after my daily routines to get any exercise.

26 I feel insecure.

27 I do not like exercising.

28 Exercising is of no interest to me.

29 I do not think I have what it takes to exercise.

30 I did not exercise at younger age either.

31 Finnish weather does not encourage me to exercise.

7. Fitness center Verde rewards each person taking part to this survey and leaving his/her contact information by offering a 30-day pass to Verde free of charge. Further, a gift card for Hotel Spa Mansion Haikko is drawn between those who left his/her contact information. Some are also offered a possibility to take part in further research carried out in cooperation with Fitness center Verde. We ask you to give your contact information below (name, e-mail and phone number) for the purposes of further research, 30-day pass and the prize draw.

Contact information is only used for above mentioned purposes. The results of this survey will be reported anonymously and in entities so that no individual respondent can be identified. The 30-day pass to Verde can be collected from Verde's reception (Työpajatie 21, 06510 Porvoo – www.verde.fi). We are possibly in contact with you with regard to the further research. The winner of the prize draw will be contacted personally.

Name:

E-mail:

Phone number:

Appendix B-1 Perceived barriers for exercisers and non-exercisers

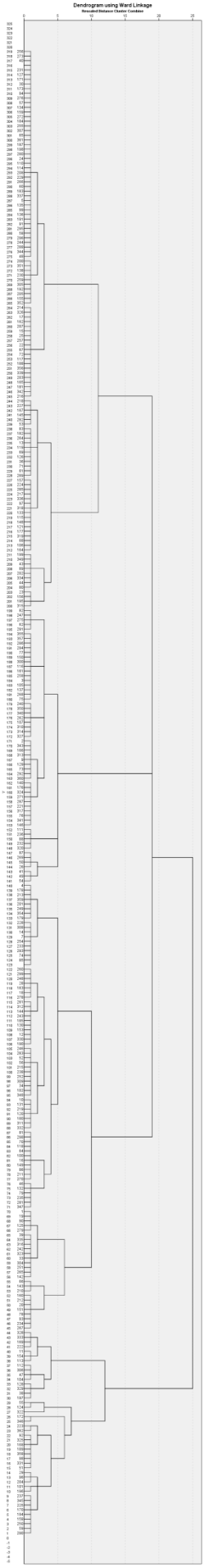
BARRIER	Exercisers			Non-exercisers		
	N	Mean	Std. Deviation	N	Mean	Std. Deviation
Exercising takes too much time.	142	2,62	1,259	219	3,21	1,342
Exercise tires me.	142	1,68	,886	219	2,50	1,318
Places for me to exercise are too far away.	142	2,28	1,355	217	2,92	1,456
I am too embarrassed to exercise.	142	1,42	,784	218	2,02	1,239
It costs too much to exercise.	141	2,55	1,436	217	2,94	1,571
Exercise facilities do not have convenient schedules for me.	139	2,11	1,220	209	2,32	1,239
I am fatigued by exercise.	142	1,43	,709	219	2,14	1,201
My spouse (or significant other) does not encourage me to exercise.	141	1,72	1,122	215	2,36	1,452
Exercise takes too much time from family relationships.	140	2,57	1,465	218	2,95	1,541
I do not like the way I look in exercise clothes.	141	1,77	1,169	218	2,40	1,551
My family members do not encourage me to exercise.	142	1,68	1,126	218	2,28	1,486
Exercise takes too much time from my family responsibilities.	142	2,19	1,243	219	2,55	1,395
Exercise is hard work for me.	142	1,76	1,051	218	2,47	1,317
There are too few places for me to exercise.	140	1,79	1,166	213	2,08	1,179
I've been thinking about getting more exercise, but I just can't seem to get started.	142	2,35	1,414	217	4,05	1,560
It's easier for me to find excuses not to exercise than to go out to do something.	140	3,01	1,711	218	3,99	1,589
I can't make myself stick to my decision of being physically more active	140	2,20	1,259	218	3,83	1,559
Exercise can be risky so I am afraid I might get hurt.	142	1,61	1,052	220	1,80	1,121
I have never learned the skills for any sport.	142	1,68	1,081	218	2,17	1,440
I really can't see learning a new sport.	142	1,61	,952	218	1,96	1,216
I'm not good enough at any physical activity to make it fun.	142	1,42	,756	217	2,13	1,413
I have no one to exercise with.	142	1,90	1,344	220	2,70	1,664
I'm embarrassed about how I will look when I exercise with others.	141	1,57	1,058	218	2,08	1,397
My usual social activities with family or friends do not include physical activity.	141	2,01	1,365	220	2,48	1,412
I'm just too tired after my daily routines to get any exercise.	142	2,23	1,259	220	3,47	1,548
I feel insecure.	140	1,67	1,000	213	2,32	1,432
I do not like exercising.	141	1,36	,777	217	2,06	1,311
Exercising is of no interest to me.	142	1,31	,643	217	1,96	1,230
I do not think I have what it takes to exercise.	142	1,27	,651	219	1,86	1,246
I did not exercise at younger age either.	142	1,69	1,261	220	2,18	1,565
Finnish weather does not encourage me to exercise.	141	1,81	1,195	214	2,27	1,495
Valid N (listwise)	129			190		

Appendix B-2 ANOVA between exercisers and non-exercisers perceived barriers

		Sum of Squares	df	Mean Square	F	Sig.
Exercising takes too much time.	Between Groups	30,020	1	30,020	17,501	,000
	Within Groups	615,803	359	1,715		
	Total	645,823	360			
Exercise tires me.	Between Groups	57,165	1	57,165	41,926	,000
	Within Groups	489,488	359	1,363		
	Total	546,654	360			
Places for me to exercise are too far away.	Between Groups	35,154	1	35,154	17,518	,000
	Within Groups	716,401	357	2,007		
	Total	751,554	358			
I am too embarrassed to exercise.	Between Groups	30,997	1	30,997	26,451	,000
	Within Groups	419,533	358	1,172		
	Total	450,531	359			
It costs too much to exercise.	Between Groups	12,491	1	12,491	5,410	,021
	Within Groups	821,948	356	2,309		
	Total	834,439	357			
Exercise facilities do not have convenient schedules for me.	Between Groups	3,775	1	3,775	2,489	,116
	Within Groups	524,903	346	1,517		
	Total	528,678	347			
I am fatigued by exercise.	Between Groups	43,667	1	43,667	40,675	,000
	Within Groups	385,408	359	1,074		
	Total	429,075	360			
My spouse (or significant other) does not encourage me to exercise.	Between Groups	34,308	1	34,308	19,350	,000
	Within Groups	627,636	354	1,773		
	Total	661,944	355			
Exercise takes too much time from family relationships.	Between Groups	12,486	1	12,486	5,462	,020
	Within Groups	813,827	356	2,286		
	Total	826,313	357			
I do not like the way I look in exercise clothes.	Between Groups	34,321	1	34,321	17,171	,000
	Within Groups	713,556	357	1,999		
	Total	747,877	358			
My family members do not encourage me to exercise.	Between Groups	30,149	1	30,149	16,398	,000
	Within Groups	658,226	358	1,839		
	Total	688,375	359			
Exercise takes too much time from my family responsibilities.	Between Groups	11,312	1	11,312	6,325	,012
	Within Groups	642,012	359	1,788		
	Total	653,324	360			
Exercise is hard work for me.	Between Groups	43,021	1	43,021	28,943	,000
	Within Groups	532,134	358	1,486		
	Total	575,156	359			
There are too few places for me to exercise.	Between Groups	7,185	1	7,185	5,217	,023
	Within Groups	483,472	351	1,377		
	Total	490,657	352			

I've been thinking about getting more exercise, but I just can't seem to get started.	Between Groups	248,353	1	248,353	109,780	,000
	Within Groups	807,631	357	2,262		
	Total	1055,983	358			
It's easier for me to find excuses not to exercise than to go out to do something.	Between Groups	82,492	1	82,492	30,752	,000
	Within Groups	954,975	356	2,683		
	Total	1037,466	357			
I can't make myself stick to my decision of being physically more active.	Between Groups	225,308	1	225,308	107,264	,000
	Within Groups	747,776	356	2,100		
	Total	973,084	357			
Exercise can be risky so I am afraid I might get hurt.	Between Groups	3,260	1	3,260	2,722	,100
	Within Groups	431,115	360	1,198		
	Total	434,376	361			
I have never learned the skills for any sport.	Between Groups	19,981	1	19,981	11,635	,001
	Within Groups	614,794	358	1,717		
	Total	634,775	359			
I really can't see learning a new sport.	Between Groups	10,297	1	10,297	8,222	,004
	Within Groups	448,326	358	1,252		
	Total	458,622	359			
I'm not good enough at any physical activity to make it fun.	Between Groups	44,267	1	44,267	30,889	,000
	Within Groups	511,610	357	1,433		
	Total	555,877	358			
I have no one to exercise with.	Between Groups	55,037	1	55,037	23,017	,000
	Within Groups	860,820	360	2,391		
	Total	915,856	361			
I'm embarrassed about how I will look when I exercise with others.	Between Groups	22,323	1	22,323	13,733	,000
	Within Groups	580,284	357	1,625		
	Total	602,607	358			
My usual social activities with family or friends do not include physical activity.	Between Groups	19,365	1	19,365	9,961	,002
	Within Groups	697,920	359	1,944		
	Total	717,285	360			
I'm just too tired after my daily routines to get any exercise.	Between Groups	131,792	1	131,792	63,420	,000
	Within Groups	748,108	360	2,078		
	Total	879,901	361			
I feel insecure.	Between Groups	35,968	1	35,968	22,012	,000
	Within Groups	573,534	351	1,634		
	Total	609,501	352			
I do not like exercising.	Between Groups	41,116	1	41,116	32,107	,000
	Within Groups	455,890	356	1,281		
	Total	497,006	357			
Exercising is of no interest to me.	Between Groups	36,116	1	36,116	33,490	,000
	Within Groups	384,993	357	1,078		
	Total	421,109	358			
I do not think I have what it takes to exercise.	Between Groups	30,072	1	30,072	27,095	,000
	Within Groups	398,443	359	1,110		
	Total	428,515	360			
I did not exercise at younger age either.	Between Groups	20,478	1	20,478	9,695	,002
	Within Groups	760,453	360	2,112		
	Total	780,931	361			
Finnish weather does not encourage me to exercise.	Between Groups	17,817	1	17,817	9,309	,002
	Within Groups	675,648	353	1,914		
	Total	693,465	354			

Appendix C Dendrogram using Ward's linkage



Appendix D-1 Determining number of clusters with ANOVA: Three cluster solution

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Factor 1	Between Groups	118,588	2	59,294	93,961	,000
	Within Groups	199,412	316	,631		
	Total	318,000	318			
Factor 2	Between Groups	77,680	2	38,840	51,071	,000
	Within Groups	240,320	316	,761		
	Total	318,000	318			
Factor 3	Between Groups	16,182	2	8,091	8,471	,000
	Within Groups	301,818	316	,955		
	Total	318,000	318			
Factor 4	Between Groups	16,525	2	8,263	8,661	,000
	Within Groups	301,475	316	,954		
	Total	318,000	318			
Factor 5	Between Groups	173,848	2	86,924	190,548	,000
	Within Groups	144,152	316	,456		
	Total	318,000	318			

Test of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
Factor 1	6,245	2	316	,002
Factor 2	16,501	2	316	,000
Factor 3	1,245	2	316	,289
Factor 4	4,056	2	316	,018
Factor 5	42,631	2	316	,000

Robust Tests of Equality of Means

		Statistic[a]	df1	df2	Sig.
Factor 1	Welch	56,980	2	100,623	,000
	Brown-Forsythe	71,147	2	121,825	,000
Factor 2	Welch	30,305	2	105,903	,000
	Brown-Forsythe	36,827	2	86,848	,000
Factor 3	Welch	6,886	2	105,700	,002
	Brown-Forsythe	7,118	2	132,462	,001
Factor 4	Welch	6,549	2	98,890	,002
	Brown-Forsythe	6,437	2	125,674	,002
Factor 5	Welch	181,244	2	87,780	,000
	Brown-Forsythe	104,455	2	92,035	,000

a. Asymptotically F distributed.

Multiple Comparisons

Games-Howell

Dependent Variable			Mean Difference (I-	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
REGR factor score 1	1	2	-1,65701985*	,16050848	,000	-2,0431653	-1,2708744
		3	,13761414	,10627698	,401	-,1144318	,3896601
	2	1	1,65701985*	,16050848	,000	1,2708744	2,0431653
		3	1,79463399*	,17892134	,000	1,3675680	2,2217000
	3	1	-,13761414	,10627698	,401	-,3896601	,1144318
		2	-1,79463399*	,17892134	,000	-2,2217000	-1,3675680
REGR factor score 2	1	2	-1,20179839*	,20189474	,000	-1,6879507	-,7156460
		3	,36826823*	,09383111	,000	,1464971	,5900393
	2	1	1,20179839*	,20189474	,000	,7156460	1,6879507
		3	1,57006662*	,20706185	,000	1,0726467	2,0674865
	3	1	-,36826823*	,09383111	,000	-,5900393	-,1464971
		2	-1,57006662*	,20706185	,000	-2,0674865	-1,0726467
REGR factor score 3	1	2	-,61464075*	,18566552	,004	-1,0605849	-,1686966
		3	-,29137456	,12742824	,061	-,5932349	,0104857
	2	1	,61464075*	,18566552	,004	,1686966	1,0605849
		3	,32326619	,20480931	,261	-,1654408	,8119732
	3	1	,29137456	,12742824	,061	-,0104857	,5932349
		2	-,32326619	,20480931	,261	-,8119732	,1654408
REGR factor score 4	1	2	-,62224915*	,19519662	,006	-1,0919435	-,1525548
		3	-,29203082	,13546900	,083	-,6135463	,0294847
	2	1	,62224915*	,19519662	,006	,1525548	1,0919435
		3	,33021833	,22196999	,302	-,1991284	,8595651
	3	1	,29203082	,13546900	,083	-,0294847	,6135463
		2	-,33021833	,22196999	,302	-,8595651	,1991284
REGR factor score 5	1	2	-,65693972*	,16949448	,001	-1,0663169	-,2475625
		3	-1,75190291*	,09266230	,000	-1,9724198	-1,5313860
	2	1	,65693972*	,16949448	,001	,2475625	1,0663169
		3	-1,09496320*	,18842791	,000	-1,5457375	-,6441889
	3	1	1,75190291*	,09266230	,000	1,5313860	1,9724198
		2	1,09496320*	,18842791	,000	,6441889	1,5457375

*. The mean difference is significant at the 0.05 level.

Appendix D-2 Determining number of clusters with ANOVA: Four cluster solution

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Factor 1	Between Groups	168,499	3	56,166	118,343	,000
	Within Groups	149,501	315	,475		
	Total	318,000	318			
Factor 2	Between Groups	146,726	3	48,909	89,950	,000
	Within Groups	171,274	315	,544		
	Total	318,000	318			
Factor 3	Between Groups	64,090	3	21,363	26,503	,000
	Within Groups	253,910	315	,806		
	Total	318,000	318			
Factor 4	Between Groups	13,935	3	4,645	4,812	,003
	Within Groups	304,065	315	,965		
	Total	318,000	318			
Factor 5	Between Groups	163,218	3	54,406	110,723	,000
	Within Groups	154,782	315	,491		
	Total	318,000	318			

Test of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
Factor 1	2,755	3	315	,043
Factor 2	37,892	3	315	,000
Factor 3	2,601	3	315	,052
Factor 4	1,915	3	315	,127
Factor 5	16,399	3	315	,000

Robust Tests of Equality of Means

		Statistic[a]	df1	df2	Sig.
Factor 1	Welch	88,596	3	87,659	,000
	Brown-Forsythe	95,949	3	146,464	,000
Factor 2	Welch	37,842	3	80,304	,000
	Brown-Forsythe	48,927	3	93,376	,000
Factor 3	Welch	21,629	3	86,739	,000
	Brown-Forsythe	20,491	3	134,004	,000
Factor 4	Welch	3,726	3	86,885	,014
	Brown-Forsythe	3,773	3	139,738	,012
Factor 5	Welch	105,637	3	79,906	,000
	Brown-Forsythe	68,072	3	117,649	,000

a. Asymptotically F distributed.

Multiple Comparisons

Games-Howell

Dependent Variable			Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
REGR factor score 1	1	2	-1,96372232*	,13468122	,000	-2,3220816	-1,6053631
		3	,66810463*	,14356929	,000	,2844906	1,0517187
		4	,27906356*	,10156276	,035	,0139400	,5441871
	2	1	1,96372232*	,13468122	,000	1,6053631	2,3220816
		3	2,63182696*	,18599563	,000	2,1426606	3,1209933
		4	2,24278589*	,15587567	,000	1,8333282	2,6522436
	3	1	-,66810463*	,14356929	,000	-1,0517187	-,2844906
		2	-2,63182696*	,18599563	,000	-3,1209933	-2,1426606
		4	-,38904107	,16361643	,091	-,8202249	,0421428
	4	1	-,27906356*	,10156276	,035	-,5441871	-,0139400
		2	-2,24278589*	,15587567	,000	-2,6522436	-1,8333282
		3	,38904107	,16361643	,091	-,0421428	,8202249
REGR factor score 2	1	2	-,88826609*	,18690645	,000	-1,3887902	-,3877419
		3	-1,96242762*	,21595178	,000	-2,5433115	-1,3815438
		4	,20931003	,08185841	,057	-,0044798	,4230998
	2	1	,88826609*	,18690645	,000	,3877419	1,3887902
		3	-1,07416153*	,28115859	,002	-1,8140037	-,3343194
		4	1,09757612*	,19777711	,000	,5721601	1,6229921
	3	1	1,96242762*	,21595178	,000	1,3815438	2,5433115
		2	1,07416153*	,28115859	,002	,3343194	1,8140037
		4	2,17173765*	,22542611	,000	1,5696228	2,7738525
	4	1	-,20931003	,08185841	,057	-,4230998	,0044798
		2	-1,09757612*	,19777711	,000	-1,6229921	-,5721601
		3	-2,17173765*	,22542611	,000	-2,7738525	-1,5696228
REGR factor score 3	1	2	-,82156338*	,17267205	,000	-1,2810242	-,3621025
		3	-1,27252977*	,20510487	,000	-1,8215188	-,7235407
		4	-,57678014*	,12873424	,000	-,9127877	-,2407726
	2	1	,82156338*	,17267205	,000	,3621025	1,2810242
		3	-,45096639	,25510276	,298	-1,1225090	,2205762
		4	,24478324	,19895204	,610	-,2779690	,7675355
	3	1	1,27252977*	,20510487	,000	,7235407	1,8215188
		2	,45096639	,25510276	,298	-,2205762	1,1225090
		4	,69574963*	,22767144	,017	,0939524	1,2975468
	4	1	,57678014*	,12873424	,000	,2407726	,9127877
		2	-,24478324	,19895204	,610	-,7675355	,2779690
		3	-,69574963*	,22767144	,017	-1,2975468	-,0939524

REGR factor score 4	1	2	-,56704831	,21661954	,056	-1,1447722	,0106756
		3	-,02653227	,18705984	,999	-,5257859	,4727214
		4	-,34599593	,14421137	,084	-,7225776	,0305858
	2	1	,56704831	,21661954	,056	-,0106756	1,1447722
		3	,54051604	,27189588	,202	-,1745970	1,2556291
		4	,22105238	,24440316	,802	-,4226734	,8647782
	3	1	,02653227	,18705984	,999	-,4727214	,5257859
		2	-,54051604	,27189588	,202	-1,2556291	,1745970
		4	-,31946366	,21863271	,466	-,8943999	,2554726
	4	1	,34599593	,14421137	,084	-,0305858	,7225776
		2	-,22105238	,24440316	,802	-,8647782	,4226734
		3	,31946366	,21863271	,466	-,2554726	,8943999
REGR factor score 5	1	2	-,72888397*	,16475655	,000	-1,1697459	-,2880221
		3	-,16273480	,17420202	,787	-,6307249	,3052553
		4	-1,77382326*	,10037828	,000	-2,0366499	-1,5109967
	2	1	,72888397*	,16475655	,000	,2880221	1,1697459
		3	,56614917	,23459860	,084	-,0508018	1,1831002
		4	-1,04493929*	,18645632	,000	-1,5367297	-,5531489
	3	1	,16273480	,17420202	,787	-,3052553	,6307249
		2	-,56614917	,23459860	,084	-1,1831002	,0508018
		4	-1,61108846*	,19485272	,000	-2,1268043	-1,0953726
	4	1	1,77382326*	,10037828	,000	1,5109967	2,0366499
		2	1,04493929*	,18645632	,000	,5531489	1,5367297
		3	1,61108846*	,19485272	,000	1,0953726	2,1268043

*. The mean difference is significant at the 0.05 level.

Appendix E Individual level pre- and post-intervention barrier measures by intervention group

		Cognitive intervention: Physical Fitness Test															
		1		2		3		4		5		6		7		8	
		Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Lack of skills and self-confidence, and self-consciousness	I have never learned the skills for any sport.	1	1	2	1	1	1	2	2	1	1	1	1	1	1	1	1
	I really can't see learning a new sport.	1	1	1	1	1	1	1	2	1	1	1	0	1	1	1	1
	I'm not good enough at any physical activity to make it fun.	1	1	1	2	1	1	2	2	1	1	1	0	1	1	1	1
	I'm embarrassed about how I will look when I exercise with others.	2	2	1	2	2	3	1	1	1	1	1	2	1	1	1	2
Activity-related affect and low self-efficacy	Exercise tires me.	4	2	2	2	2	2	2	1	2	2	3	1	2	1	3	3
	I am too embarrassed to exercise.	1	1	2	2	1	1	1	1	1	1	1	1	1	2	2	2
	I do not like exercising.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1
	Exercising is of no interest to me.	1	1	1	1	2	1	1	1	1	1	1	2	1	1	2	1
	I do not think I have what it takes to exercise.	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1
Lack of willpower and feeling of indolence	I've been thinking about getting more exercise, but I just can't seem to get started.	6	4	3	2	6	6	4	4	2	5	5	3	4	6	5	4
	It's easier for me to find excuses not to exercise than to go out to do something.	3	4	6	4	6	6	3	4	2	4	5	5	4	5	1	1
	I can't make myself stick to my decision of being physically more active	5	3	2	2	4	6	3	3	3	4	5	2	5	5	4	2
	I'm just too tired after my daily routines to get any exercise.	4	4	4	3	2	4	2	3	6	6	1	3	4	4	1	1
Lack of resources	Places for me to exercise are too far away.	2	1	5	5	2	1	2	2	1	1	2	2	2	3	3	1
	Exercise facilities do not have convenient schedules for me.	4	4	2	5	1	2	2	1	4	1	3	2	1	1	4	2
	There are too few places for me to exercise.	1	1	2	2	2	2	2	1	4	1	1	1	1	1	1	1
Family discouragement	My spouse (or significant other) does not encourage me to exercise.	4	3	3	2	1	1	2	2	3	2	2	2	1	1		1
	My family members do not encourage me to exercise.	4	3	3	2	1	1	2	2	3	2	3	3	1	1	1	1
Items not included in the facor solution	Exercising takes too much time.	2	4	5	4	2	2	2	2	6	6	2	2	3	4	4	4
	It costs too much to exercise.	5	4	5	4	3	3	1	1	6	6	1	1	3	4	1	1
	I am fatigued by exercise.	2	3	2	2	1	2	2	2	1	2	1	1	1	1	4	1
	Exercise takes too much time from family relationships.	6	5	6	5	4	2	3	4	6	6	5	6	3	4	2	1
	I do not like the way I look in exercise clothes.	3	4	3	4	6	4	1	1	1	1	2	2	1	2	1	1
	Exercise takes too much time from my family responsibilities.	4	4	5	5	1	2	2	4	4	6	2	2	1	3	1	1
	Exercise is hard work for me.	3	2	2	2	1	1	2	2	6	5	2	2	1	4	1	4
	Exercise can be risky so I am afraid I might get hurt.	1	1	1	1	2	1	2	2	1	1	1	1	1	1	1	1
	I have no one to exercise with.	3	3	1	2	1	2	2	2	1	4	4	2	1	1	1	7
	My usual social activities with family or friends do not include physical activity.	4	4	1	2	1	1	3	3	3	4	3	5	1	2	1	4
	I feel insecure.	2	1	1	1	2	2	1	2	2	3	2	2	1	1	1	2
	I did not exercise at younger age either.	1	1	3	2	1	1	1	1	1	1	1	1	5	5	6	1
	Finnish weather does not encourage me to exercise.	2	4	1	1	1	1	2	1	6	4	3	2	3	1	5	5

Affective intervention: Method Mentra

	9		10		11		12		13		14		15		16		17		18		19		20		21		22		23		24	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Lack of skills and self-confidence, and self-consciousness	1	1	4	4	3	3	3	3	3	3	2	2	3	3	1	1	2	1	4	3	1	1	1	3	1	1	1	1	4	4	2	2
	1	2	4	4	3	5	2	3	4	3	2	2	3	3	1	2	2	1	4	7	6	1	1	1	1	1	1	2	1	3	2	2
	1	2	4	4	3	4	3	2	3	4	3	2	3	3	1	3	2	1	3	2	1	1	1	1	1	1	1	1	2	3	2	3
	3	2	5	4	4	3	3	1	2	2	4	4	4	4	1	1	1	1	3	1	1	3	1	1	1	1	1	1	4	4	5	2
Activity-related affect and low self-efficacy	3	2	5	4	3	5	3	1	3	3	5	3	4	4	4	4	3	1	2	2	1	3	1	1	1	1	1	1	4	3	6	5
	2	2	4	4	4	4	1	1	2	3	3	4	3	4	4	2	1	1	1	2	1	1	1	1	1	1	1	1	4	3	4	4
	3	2	4	4	3	4	1	1	2	3	3	2	3	3	5	5	2	1	1	2	1	2	1	1	1	1	1	1	4	2	4	4
	3	2	3	5	2	4	1	1	3	3	2	2	3	3	4	2	2	1	1	2	1	1	1	1	1	1	1	1	2	2	4	4
	2	2	3	4	3	5	1	2	2	3	2	2	3	4	2	2	2	1	2	1	2	1	1	1	1	1	1	1	2	2	4	4
Lack of willpower and feeling of indolence	5	5	4	6	5	5	3	1	5	6	6	6	5	4	6	6	3	3	4	4	5	1	1	3	1	1	6	6	6	4	6	6
	5	4	3	4	5	5	2	2	5	4	6	5	4	4	6	5	3	2	4	7	4	1	1	4	1	1	6	6	5	4	6	6
	5	4	4	4	5	5	2	2	5	5	6	5	5	4	5	5	3	3	4	7	6	4	1	3	1	1	6	6	6	4	6	6
	3	2	6	5	3	4	2	2	5	5	6	5	4	4	5	5	4	5	2	4	4	3	1	2	1	1	6	6	2	2	5	4
Lack of resources	3	2	5	4	3	2	4	3	2	3	4	3	4	3	3	2	3	1	1	2	2	1	1	1	1	1	6	4	5	5	6	6
	2	2	3	3	3	4	1	2	2	3	3	2	3	3	2	2	2	1	2	1	1	1	1	1	1	7	3	1	7	7	4	4
	2	2	3	3	3	4	2	2	3	2	3	3	3	4	1	3	2	1	1	2	1	1	1	1	1	1	3	5	7	7	6	4
Family discouragement	1	1	4	4	3	4	3	1	2	2	2	1	4	3	1	1	4	4	1	7	1	1	1	1	1	1	6	4	5	3	2	2
	1	1	5	4	3	2	1	2	2	3	2	2	3	3	1	1	4	4	1	3	1	1	1	1	1	1	6	6	5	3	2	1
Items not included in the factor solution	2	3	5	5	3	5	2	2	4	4	5	3	3	4	4	4	4	5	2	2	1	4	1	5	6	1	6	5	4	4	6	5
	1	2	5	3	5	1	2	2	4	3	3	2	5	3	4	2	2	1	1	1	1	1	1	1	1	1	3	1	4	3	6	1
	3	2	3	4	5	3	2	1	4	3	3	3	3	3	4	3	1	1	2	1	1	4	1	1	1	1	1	1	4	3	5	4
	2	2	5	4	3	2	2	3	4	4	4	3	5	4	5	4	4	4	2	2	4	3	1	1	1	1	6	6	4	2	2	2
	6	6	6	4	5	5	3	3	2	2	4	5	4	4	1	1	2	1	2	4	1	1	1	1	1	1	1	1	5	5	4	3
	2	2	5	4	3	2	3	2	4	4	5	5	3	3	4	4	4	4	2	1	4	3	1	3	1	1	6	5	4	3	1	2
	2	2	5	5	4	6	3	1	4	3	5	5	4	4	4	5	2	1	2	2	3	4	1	1	1	1	6	4	5	4	5	5
	2	2	2	3	4	3	1	1	4	3	4	3	2	3	1	2	1	1	2	3	1	4	1	1	1	1	1	1	1	2	3	1
	6	1	4	4	3	5	4	3	4	2	5	5	4	4	1	2	3	1	2	3	1	1	1	1	1	1	6	6	5	4	6	5
	2	3	5	5	3	4	4	2	2	3	5	2	2	2	1	1	3	3	3	2	6	1	1	1	1	1	1	6	5	3	2	3
	2	2	5	5	4	4	1	3	4	3	2	3	4	4	1	3	1	1	2	3	5	3	1	1	1	1	5	5	2	2	4	1
	1	1	2	3	1	2	1	1	3	3	2	1	2	4	1	1	1	1	1	3	1	1	1	1	6	1	1	1	2	2	1	1
	2	2	4	3	3	4	2	1	2	2	2	2	2	4	1	2	2	1	1	4	1	1	1	1	1	1	1	1	3	2	6	4

Behavioral intervention: Fustra Demo Class

	25		26		27		28		29		30		31		32		33		34	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Lack of skills and self-confidence, and self-consciousness	2	1	1	1	1	1	2	3	5	4	3	3	5	5	1	1	1	5	6	4
	2	1	1	1	1	1	1	5	3	2	2	3	3	5	1	1	1	4	4	2
	2	2	1	1	1	1	4	4	3	3	4	4	5	5	1	1	1	4	3	3
	2	3	1	1	1	1	3	2	5	4	5	5	1	3	1	1	2	3	3	3
Activity-related affect and low self-efficacy	4	4	1	1	3	2	3	2	3	2	4	4	4	5	1	1	3	2	2	2
	2	2	1	1	1	1	2	3	4	3	3	4	5	5	1	1	2	5	2	2
	2	2	1	1	2	1	3	3	3	2	3	3	4	5	1	1	3	2	2	2
	2	2	1	1	2	1	5	3	2	2	3	3	2	4	1	1	2	3	2	2
	2	2	1	1	1	1	3	4	2	2	3	3	1	4	1	1	1	4	2	2
Lack of willpower and feeling of indolence	2	3	1	1	1	1	6	6	4	5	3	4	6	5	3	2	6	6	5	6
	3	4	1	1	6	5	6	6	5	5	4	3	6	5	1	2	6	6	4	3
	4	2	1	1	2	1	6	6	4	4	4	3	6	5	1	3	5	6	5	5
	2	1	1	1	1	2	6	4	5	4	4	4	4	6	1	2	5	1	2	2
Lack of resources	7	3	1	1	4	1	2	2	5	3	5	5	2	3	1	1	3	3	2	2
	7	2	1	1	1	1	3	4	3	3	4	4	2	3	1	1	2	3	2	2
	2	2	1	1	2	2	2	3	2	2	2	7	2	3	1	1	2	2	1	2
Family discouragement	2	4	3	1	6	5	1	1	2	1	5	4	1	2	2	2	2	2	1	2
	2	3	3	3	6	5	1	1	2	6	5	5	1	2	2	2	2	1	1	2
Items not included in the factor solution	2	4	1	1	2	2	2	3	4	4	4	4	4	5	3	3	4	5	3	3
	2	2	2	1	2	2	3	3	4	3	4	3	6	5	1	1	3	4	4	5
	3	2	1	1	1	1	2	3	3	3	3	2	2	5	1	1	5	2	2	2
	2	7	2	2	5	5	1	1	4	4	5	2	4	5	3	4	2	2	1	2
	2	2	1	1	1	2	2	5	5	4	5	2	1	5	3	3	2	5	2	2
	2	2	1	1	4	2	1	1	4	4	5	4	1	1	1	3	2	2	1	2
	3	2	1	1	1	1	4	6	3	3	3	7	4	5	1	2	2	3	2	2
	2	2	1	1	1	1	1	2	2	2	4	4	4	4	1	1	1	2	2	2
	3	3	1	1	1	1	3	4	5	4	5	4	1	5	3	2	5	3	6	3
	2	2	3	1	6	5	1	2	3	3	3	2	1	2	3	2	2	2	3	4
	2	1	1	1	1	1	4	4	3	2	4	4	2	4	1	1	5	2	3	4
	2	2	1	1	4	5	3	4	2	3	2	2	1	5	1	1	1	4	4	4
	2	2	1	1	1	2	3	5	3	2	3	5	1	2	1	1	1	3	3	4

Appendix F Repeated measures for pre- and post-intervention barriers by intervention group

	BARRIERS	Within-subjects barrier mean		Mean difference	Sig.	N
		Pre-intervention	Post-intervention			
Lack of skills and self-confidence, and self-consciousness	I have never learned the skills for any sport.	1,25	1,13	-0,125	0,351	8
	I really can't see learning a new sport.	1	1,13	0,125	0,351	8
	I'm not good enough at any physical activity to make it fun.	1,13	1,25	0,125	0,351	8
	I'm embarrassed about how I will look when I exercise with others.	1,25	1,76	0,507	0,033**	8
Activity-related affect and low self-efficacy	Exercise tires me.	2,5	1,75	-0,75	0,048**	8
	I am too embarrassed to exercise.	1,25	1,38	0,125	0,863	8
	I do not like exercising.	1,13	1	0,188	0,502	8
	Exercising is of no interest to me.	1,25	1,19	-0,063	0,825	8
	I do not think I have what it takes to exercise.	1	1,07	0,073	0,624	8
Lacl of willpower and feeling of indolence	I've been thinking about getting more exercise, but I just can't seem to get started.	4,38	4,25	-0,125	0,85	8
	It's easier for me to find excuses not to exercise than to go out to do something.	3,75	4,08	0,326	0,472	8
	I can't make myself stick to my decision of being physically more active	3,88	3,36	-0,519	0,422	8
	I'm just too tired after my daily routines to get any exercise.	3	3,52	0,523	0,223	8
Lack of resources	Places for me to exercise are too far away.	2,38	2	-0,375	0,285	8
	Exercise facilities do not have convenient schedules for me.	2,63	2,25	-0,375	0,584	8
	There are too few places for me to exercise.	1,75	1,25	-0,5	0,227	8
Family discouragement	My spouse (or significant other) does not encourage me to exercise.	2,29	1,86	-0,429	0,078*	7
	My family members do not encourage me to exercise.	2,25	1,88	-0,375	0,08*	8
Items not included in the factor solution	Exercising takes too much time.	3,25	3,5	0,25	0,451	8
	It costs too much to exercise.	3,13	3	-0,125	0,598	8
	I am fatigued by exercise.	1,75	1,75	0	1	8
	Exercise takes too much time from family relationships.	4,38	4,13	-0,25	0,563	8
	I do not like the way I look in exercise clothes.	2,25	2,38	0,125	0,732	8
	Exercise takes too much time from my family responsibilities.	2,5	3,38	0,875	0,041**	8
	Exercise is hard work for me.	2,25	2,75	0,5	0,407	8
	Exercise can be risky so I am afraid I might get hurt.	1,25	1,07	-0,177	0,211	8
	I have no one to exercise with.	1,86	2,29	0,429	0,482	7
	My usual social activities with family or friends do not include physical activity.	2,13	3,1	0,975	0,033**	8
	I feel insecure.	1,5	1,69	0,188	0,502	8
	I did not exercise at younger age either.	2,38	1,62	-0,756	0,262	8
	Finnish weather does not encourage me to exercise.	2,88	2,43	-0,443	0,365	8

** Mean significantly different at 0.05 level

* Mean significantly different at 0.1 level

	BARRIERS	Within-subjects barrier mean		Mean difference	Sig.	N
		Pre-intervention	Post-intervention			
Lack of skills and self-confidence, and self-consciousness	I have never learned the skills for any sport.	2,25	2,25	0	1	16
	I really can't see learning a new sport.	2,27	2,33	0,067	0,879	15
	I'm not good enough at any physical activity to make it fun.	2,12	2,31	0,188	0,423	16
	I'm embarrassed about how I will look when I exercise with others.	2,69	2,2	-0,49	0,106	16
Activity-related affect and low self-efficacy	Exercise tires me.	3,06	2,66	-0,404	0,18	16
	I am too embarrassed to exercise.	2,31	2,36	0,046	0,816	16
	I do not like exercising.	2,44	2,36	-0,079	0,708	16
	Exercising is of no interest to me.	2,13	2,22	0,094	0,723	16
	I do not think I have what it takes to exercise.	2,06	2,26	0,2	0,343	16
Lacl of willpower and feeling of indolence	I've been thinking about getting more exercise, but I just can't seem to get started.	4,44	4,18	-0,255	0,502	16
	It's easier for me to find excuses not to exercise than to go out to do something.	4,13	3,8	-0,333	0,334	15
	I can't make myself stick to my decision of being physically more active	4,4	4,07	-0,333	0,207	15
	I'm just too tired after my daily routines to get any exercise.	3,69	3,7	0,01	0,967	16
Lack of resources	Places for me to exercise are too far away.	3,31	2,71	-0,604	0,015**	16
	Exercise facilities do not have convenient schedules for me.	2,29	2,15	-0,132	0,584	14
	There are too few places for me to exercise.	2,33	2,52	0,183	0,518	15
Family discouragement	My spouse (or significant other) does not encourage me to exercise.	2,67	2,21	-0,457	0,078*	15
	My family members do not encourage me to exercise.	2,44	2,4	-0,038	0,868	16
Items not included in the factor solution	Exercising takes too much time.	3,63	3,78	0,157	0,759	16
	It costs too much to exercise.	3	1,74	-1,258	0,006**	16
	I am fatigued by exercise.	2,69	2,39	-0,295	0,305	16
	Exercise takes too much time from family relationships.	3,38	2,95	-0,423	0,032**	16
	I do not like the way I look in exercise clothes.	3	2,95	-0,048	0,825	16
	Exercise takes too much time from my family responsibilities.	3,25	3	-0,251	0,26	16
	Exercise is hard work for me.	3,5	3,33	-0,17	0,542	16
	Exercise can be risky so I am afraid I might get hurt.	1,94	2,13	0,188	0,53	16
	I have no one to exercise with.	3,5	2,98	-0,517	0,209	16
	My usual social activities with family or friends do not include physical activity.	2,88	2,64	-0,233	0,674	16
	I feel insecure.	2,75	2,76	0,014	0,965	16
	I did not exercise at younger age either.	1,69	1,67	-0,013	0,973	16
	Finnish weather does not encourage me to exercise.	2,13	2,19	0,063	0,843	16

** Mean significantly different at 0.05 level

* Mean significantly different at 0.1 level

	BARRIERS	Within-subjects barrier mean: Pre-intervention	Within-subjects barrier mean: Post-intervention	Mean difference	Sig.	N
Lack of skills and self-confidence, and self-consciousness	I have never learned the skills for any sport.	2,7	2,76	0,06	0,902	10
	I really can't see learning a new sport.	1,9	2,51	0,605	0,341	10
	I'm not good enough at any physical activity to make it fun.	2,5	2,75	0,25	0,343	10
	I'm embarrassed about how I will look when I exercise with others.	2,4	2,59	0,19	0,526	10
Activity-related affect and low self-efficacy	Exercise tires me.	2,8	2,5	-0,3	0,193	10
	I am too embarrassed to exercise.	2,3	2,7	0,4	0,269	10
	I do not like exercising.	2,4	2,2	-0,201	0,343	10
	Exercising is of no interest to me.	2,2	2,17	-0,03	0,929	10
	I do not think I have what it takes to exercise.	1,7	2,38	0,683	0,11	10
Lacl of willpower and feeling of indolence	I've been thinking about getting more exercise, but I just can't seem to get started.	3,7	3,9	0,2	0,443	10
	It's easier for me to find excuses not to exercise than to go out to do something.	4,2	4,02	-0,177	0,501	10
	I can't make myself stick to my decision of being physically more active	3,8	3,6	-0,2	0,591	10
	I'm just too tired after my daily routines to get any exercise.	3,1	2,7	-0,395	0,481	10
Lack of resources	Places for me to exercise are too far away.	2,78	2,33	-0,444	0,312	9
	Exercise facilities do not have convenient schedules for me.	2,11	2,44	0,333	0,081*	9
	There are too few places for me to exercise.	1,67	2	0,333	0,081*	9
Family discouragement	My spouse (or significant other) does not encourage me to exercise.	2,5	2,4	-0,1	0,798	10
	My family members do not encourage me to exercise.	2,5	3	0,5	0,299	10
Items not included in the factor solution	Exercising takes too much time.	2,9	3,4	0,5	0,052*	10
	It costs too much to exercise.	3,1	2,9	-0,2	0,443	10
	I am fatigued by exercise.	2,3	2,2	-0,1	0,84	10
	Exercise takes too much time from family relationships.	3	3	0	1	9
	I do not like the way I look in exercise clothes.	2,4	3,1	0,7	0,322	10
	Exercise takes too much time from my family responsibilities.	2,2	2,2	0	1	10
	Exercise is hard work for me.	2,33	2,78	0,444	0,169	9
	Exercise can be risky so I am afraid I might get hurt.	1,9	2,06	0,161	0,182	10
	I have no one to exercise with.	3,3	2,96	-0,336	0,595	10
	My usual social activities with family or friends do not include physical activity.	2,7	2,47	-0,226	0,505	10
	I feel insecure.	2,6	2,45	-0,15	0,702	10
	I did not exercise at younger age either.	2,1	3,14	1,043	0,054*	10
	Finnish weather does not encourage me to exercise.	1,9	2,7	0,797	0,037**	10

** Mean significantly different at 0.05 level

* Mean significantly different at 0.1 level